

From the house of Amar Chitra Katha and Tinkle

# BRAINWAVE™

SCIENCE IS JUST A GAME

Vol. 02 Issue 09  
September 2013  
48 pages  
8-15 years  
₹60

**All About Magnetism**  
Why study it?

p47  
**Spot the errors and win Rs. 500!**

p07  
**Win**  
*Cartoon Network gift hampers*



p46 **Treasure Hunt**  
Win cool books from

**LEAD ▶ START**  
Publishing

p22 **Fan Fiction**

Win a Wolverine  
DVD by Toonz  
Studios and  
Excel Home  
Entertainment!

p27 **Smartenstien**

10+ gifts to be won!

p12 **Cover Story**

**Magnetism demystified**

 /brainwavemag

Join 39k other fans

p29

**Now, get more bang  
for your buck!**

The interview (Expert Talk) was classy and the choice of the toy 'Bottle Light' was excellent. This is one of my favourites. 3 weeks ago, Prof. Ashok Sen FRS visited us - he just won the Padma Bhushan. Kayomarz will be delighted to see Prof. Sen having a peek at the bottle light.

- Arvind Gupta, Scientist and Educator, about the February 2013 issue of the magazine - Inventions & Discoveries



*Sabse bhari,  
offer hamari*



*Har 5 rupaiye ke pack mein  
pao 14% extra*

**Kreams<sup>®</sup>**  
**Gold<sup>™</sup>**



\*MRP Rs.5/- INCL. OF ALL TAXES FOR NET WEIGHT 50g + 7g = 57g.

everest/PB/284-13

# Laws of Attraction

Dear young friends,

As a child, I used to read a lot. I would go to the Sunday secondhand book market with 25 Rs., come back with 2-3 books of all kinds and finish them by the next Sunday. But one thing I remember distinctly is that I never read the editor's note! Do you?

Why do you think it is so? And what can I do to make it interesting for you? Email your thoughts to me. The most interesting ones will get a great gift, handpicked by me, especially for you!

And since you are writing to me anyway, I would love to hear about how this issue helps you understand why magnetism is so important in science and technology, and what its practical applications are.

Let's see you say this fast without mistakes - *She sells sea shells*.  
SK, sasikanth.c@ack-media.com

# BRAINWAVE™

Vol. 02 | Issue 09 | September 2013

## Editor & General Manager

Sasikanth C

## Consulting Art Director

Savio Mascarenhas

## Assistant Editor

Priyanka Talreja

## Design Lead

Kashmira Sarode

## Jr. Designer

Saudamini Tambay

## Resident Geek

Kayomarz Bacha

## Founding Editor & Art Director

Vinayak Varma

## Advisory Board

Arvind Gupta

Scientist & Educator

AS Manekar, Director

Nehru Science Centre, Mumbai

Hari Parameswaran

Scientist & Educator

Dr. Chandrakant Shukre

Astrophysicist

Maya Menon, Director

The Teacher Foundation

Geetha Narayanan, Director

Srishti School of Art, Design & Technology

Dr. Balaji Sampath

Aid India Foundation

Siddharth Rao, Director

Agumbe Rainforest Research Station

## Subscriptions:

brainwave@ack-media.com

**Brainwave is Printed and Published by Vijay Sampath on behalf of Amar Chitra Katha Private Limited Printed at Indigo Press (India) Pvt. Ltd., Plot No. 1, C/716, Opp. Dadoji Konddeo Cross Road, Byculla (E), Mumbai 400027 Published at Krishna House, 3rd Floor, Raghuvanshi Mills Compound, Senapati Bapat Marg, Lower Parel (West), Mumbai 400013.**

Cover artwork by **Saudamini Tambay**



No part of this magazine may be reproduced without the express consent of Amar Chitra Katha Private Limited (ACK). Any reproduction, modification, distribution, transmission, republication, display or exploitation in any way of the content(s), in whole or in part, of this magazine is strictly prohibited. ACK makes no warranties or guarantees, express or implied, written or oral, as to the contents of the magazine, the information, materials or opinions, included in this magazine. In no event shall ACK be liable for damages of any kind arising as a consequence of using or following any method or formula as mentioned in the magazine, including but not limited to direct, indirect, incidental, punitive and consequential damages.

## Consumer Complaints:

+91-22-6629 6999

customerservice@ack-media.com

## Business Queries & Customer Service Escalations:

sasikanth.c@ack-media.com

## Ad-sales:

advertisingsales@ack-media.com

## Credits:

Carisa R & Jayanthi V

Eric D'souza & Team

Heta D & Shilpi M

India Book House & Team

Janak F, Yogesh G & Team

K.K. Arun, Subir & Dan

Lalit S & Manali S

Mayur S & Team

Mirnalini Surendran

Narayan M & Rajesh Pathak

Prakash B, Sandya J & Team

Sagar S & Shrikant W

Sandeep S & Team

Swati Gupta

## VP Operations

Sandeep Padoshi

## Digital Business Head

Shubhadeep Bhattacharya

# BRAINWAVE™

## CONTENTS

COVER  
STORY

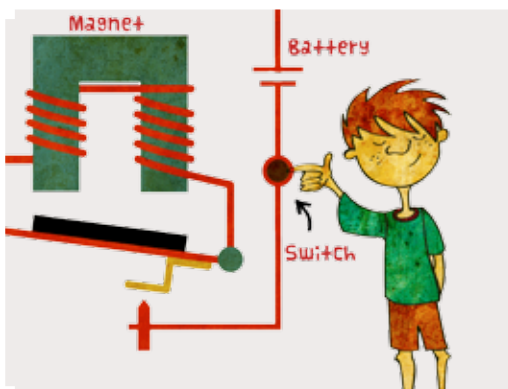
12



## MAGNETISM DEMYSTIFIED



In which we come face-to-face with the mysterious magnetic force, camp with the compass and ring the school bell using magnetism ...



### FUN-DO AND LEARN

- p.06 Toybox
- ▲■ p.24 Planet Ninjas★
- ▲ p.25 Eye See★
- ◆ p.28 Practical Science
- ▲ p.29 Magic Science★
- ◆ p.34 DIY★
- ◆ p.36 Practical Science 2★



## FREEBIES



p.49, 50, 51 Only For Digital Subscribers

## READER CONTRIBUTION

- p.22 Fan Fiction★
- p.23 Letters from Readers
- p.23 Solutions & Winners



## FUN FACTS



● p.30 Story Storeys

## COMICS

- p.08 History Maker
- ▲ p.10 Toon Talk
- + p.18 Science Fiction★
- ▲■ p.32 The Smarties
- + p.37 Time Gliders



## KNOW IT ALL

- p.05 Ask Us Why★
- + p.11 Flash News
- p.26 Wacky Tech
- p.31 Celeb Science



## MORE PRIZES!

- p.07 CN Contest★
- p.27 Be a Smartenstein★
- p.45 BW Fun-do Band★
- p.45 BW Super-teacher★
- p.46 Treasure Hunt★
- p.47 Spot the Errors!★

# MEET THE SMARTIES



**Dr. Dodo:** Dr. Dodo is the co-founder of BW Labs and is the last living dodo. He holds a PhD in anachronomaly and parallel universes from the University of Clockwindistan. He invented the Galileo series of time machines.



**Skree!:** Skree! is the other founder of BW Labs. She loves dangerous experiments. She makes mini black holes before breakfast and has dark matter for lunch.



**Arby:** Arby is a genius who will grow up to be Aryabhata. He came to the future, thanks to Dr. Dodo's time machine. He is a fan of numbers, banana fritters and robot wars.



**Mr X:** Mr. X, short for Xavier, was once Dr. Dodo's student. X is as brilliant as Alby and Arby, and by virtue of his knowledge of science, as powerful as Bhoo when the situation demands.



**Bhoomi:** Bhoomi, a.k.a. Bhoo, is an enigma. No one knows where she is from and how she came into being. She is made up of earth, wind, fire, and water in equal parts. Her alter-ego is Gaia Goel, a world famous science sleuth.

**Alby:** Alby will grow up to be Albert Einstein. However, now, like Arby, he too has been sucked into the future. When he is not researching, he plays the violin.





## How do telephones connect to other telephones so quickly? - Arnav Goel

There used to be a time when no one said 'landline' because all telephones were landlines. Even before that, there was a time when one did not dial or key in a telephone number. The telephone was connected to a telephone exchange by a wire or line, and when one picked up the handset at home, a telephone operator at the exchange would ask who to connect to. Then the operator would connect one's telephone line to the other person's with a cable, and you could start talking. If the operator was too busy or taking a break, one just had to wait or try later. Long distance calls involved a series of operators and were so hard to connect that the telephone exchange would call back hours later with the connection!

Today, human operators have been replaced by automatic switches and computers that



make connections automatically and quickly. It doesn't matter if you're calling someone in the next room or halfway around the world! ■

---

## How is darkness measured? Does it have any units? - Revanth Kausikan

The obvious answer is that darkness is only the absence of light, just as silence is the absence of sound. So, the same units that measure how much light there is also tell us how little light there is. The science that deals with measuring light as seen by the human eye is called *photometry*. One of the many photometric units is the *candela*, defined as the intensity of light emitted by a common candle.

We must remember though, that what we humans call light is only a small part of the electro-magnetic spectrum that we can see. A place that is pitch dark to us may appear brightly lit to an insect or another animal.

But if we're talking about the night sky, it turns out that there actually is a measure of darkness. It is called the *Bortle* scale, and is used by astronomers, who need dark skies to view stars. The Bortle scale ranges from 1, that denotes the darkest night skies found on earth, to 9, that denotes the brightly lit inner-city skies. ■

---

Have a burning question? Email it to us at [brainwave@ack-media.com](mailto:brainwave@ack-media.com) with 'Ask Us Why' as the subject. The best question gets published and wins two cool Amar Chitra Katha comics!

---



# Magnetic Needle

by Kayomarz Bacha and Arvind Gupta

## You need:

- A needle
- Two styrofoam or thermocol balls
- A bowl
- Water
- A bar magnet (available at all mega-stationery stores for Rs. 25)
- Compass (optional, for verification)



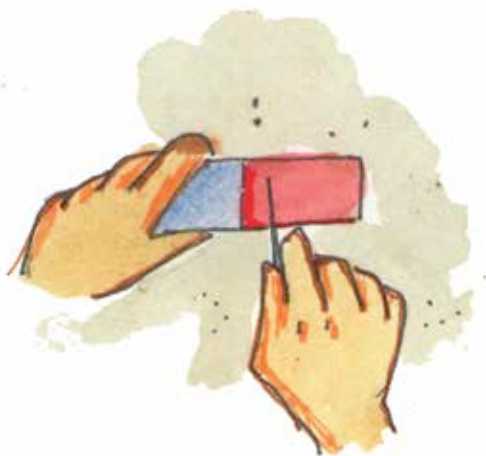
Artwork: Sarthak Sinha

## Method:

### Step 1

Stroke the needle repeatedly with one end of the bar magnet in any one direction.

NOTE: If the pin is stroked in more than one direction, the experiment will not produce desired results.



### Step 2

Fill the bowl with water.



### Step 3

Poke the two ends of the needle into the two thermocol balls.





#### Step 4

Place the needle in the bowl of water.  
You will notice that the needle automatically  
orients itself in the north-south direction, just  
like all magnets do.

.....

#### Step 5

Remove the needle from the water and place it  
in another direction. Observe what happens.

.....



### Why does this happen?

Materials that are attracted to magnets, like iron or steel, have an internal structure that is a bit like thousands of tiny magnets. These are normally pointing in multiple directions

and so, cancel each other out, making the metal non-magnetic. But by stroking the needle with a magnet, we end up realigning the tiny molecules within it in one direction, making it behave like a magnet. ■

# REGULAR SHOW™

## MON - FRI AT 4 PM



CARTOON NETWORK™

BRAINWAVE

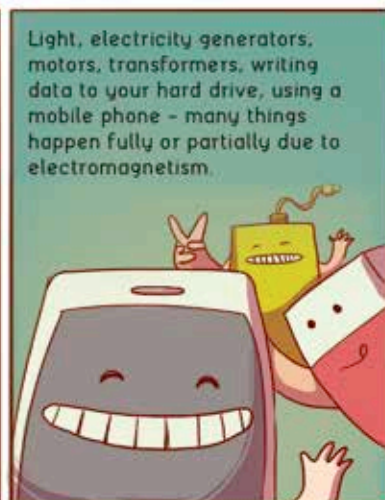
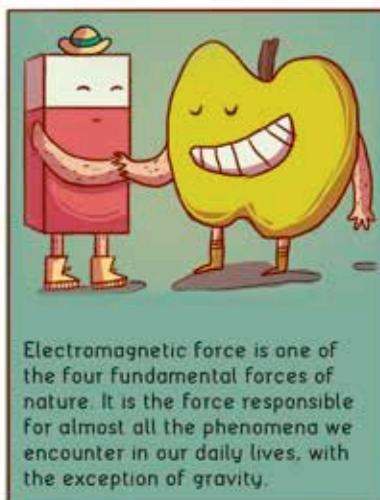
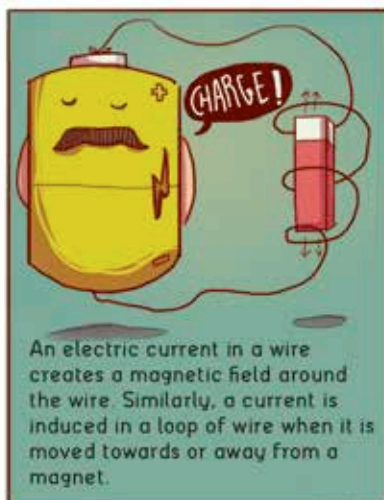
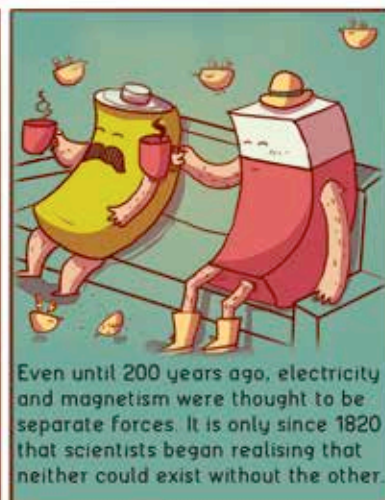
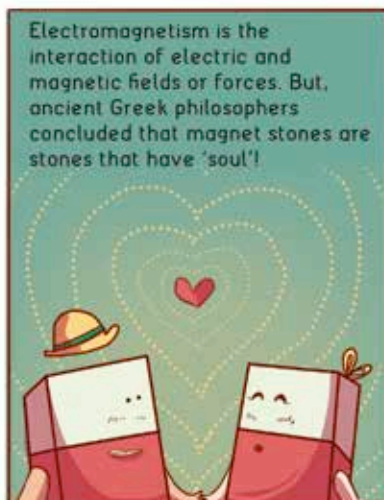
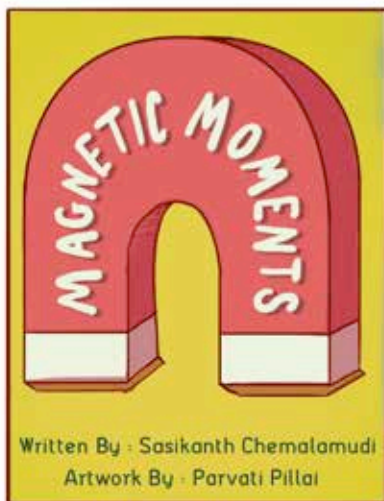
Two best friends, a blue jay named Mordecai and a raccoon named Rigby, try to turn their regular, boring job into exciting adventures that usually turn into a hilarious mess.

Take a look at these 5 magnetic facts and tell us which is true and which is false!

- Our Earth acts like a big magnet. [ T / F ]
- Magnetism was first discovered in a natural rock called magnetite, or lodestone. [ T / F ]
- The magnetic compass has a pivoted needle that points to the Earth's geographic North Pole. [ T / F ]
- The Earth's magnetic field extends far into space. [ T / F ]
- Scientists measure magnetic fields with an instrument called a magnetometer. [ T / F ]

Send all answers to [brainwave@ack-media.com](mailto:brainwave@ack-media.com) and win exclusive gift hampers from Cartoon Network!

September 2016 07





In 1820, Hans Christian Ørsted, Danish physicist and chemist, noticed that a compass needle deflects when electric current from a battery is switched on and off.



He confirmed a direct relationship between electricity and magnetism, but could not come up with a scientific explanation for it.

Shortly after, in the same year, André-Marie Ampère presented the scientific explanation for the phenomenon observed by Ørsted.



He explained the relationship between electricity and magnetism with an equation known as Ampère's Law. His research contributed to the development of the **galvanometer**<sup>6</sup> and the electromagnetic telegraph.



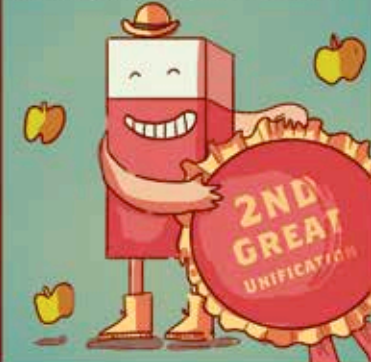
In 1831, Michael Faraday discovered electromagnetic induction and modelled Faraday's law of induction. He demonstrated that changing magnetic field produces an electric field, and constructed the electric dynamo, the first electric power generator.



In 1860, James Clerk Maxwell, a Scottish theoretical physicist, formulated a set of equations that united the previously unrelated observations, experiments, and equations of electricity and magnetism into a consistent theory.

Maxwell's achievement has been called the 'second great unification in physics', after the first one realised by Isaac Newton\*

\* Refer to August 2013 History Maker on Isaac Newton.



This unification of electricity and magnetism, which was observed by Michael Faraday and extended by James Clerk Maxwell was further proved by Hertz, and put to practical use by Marconi who invented long distance radio transmission.

This is one of the key accomplishments of 19th century mathematical physics and has far-reaching consequences that define our life even today, which you will read about in the rest of this issue.



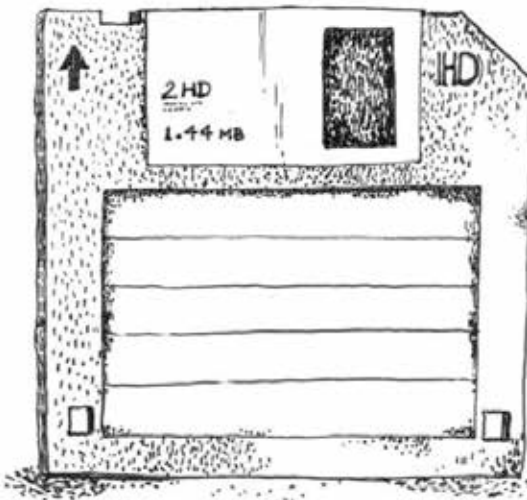
The END



Mars rovers would be nothing without magnets! Each rover carries three sets of magnets - one to collect magnetic rock samples when the rover grinds into rocks on Mars, a second to separate magnetic material from the Mars dust, and the third is to deflect wind-carried magnetic dust.

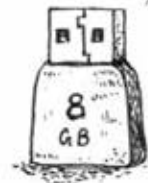
Artwork: Alicia Souza

Floppies are magnetic storage devices. They store information magnetically and are written or read with the help of magnetic heads. They are now no more in use, thanks to the USB flash drives. Flash drives are electrical in nature, smaller in size, hold exponentially greater amount of data, and are less fragile - mechanically and magnetically.



HEY GRANDPA.

BYTE ME!!



Artwork: Somesh Kumar





## NO MORE MAGNETS PLEASE



**H**ealth Canada, the department responsible for public health in Canada, has now asked all citizens to return any novelty products containing small, powerful magnets.

This initiative was taken when many kids had to be rushed to hospitals due to accidental consumption of magnets. Some children also needed emergency surgeries to remove

magnets they swallowed as magnets have the ability to attract one another while moving through the intestines. It was also observed that magnets could trap intestinal tissue between them causing life-threatening blockages or tearing.

*BuckyBalls*, a company that deals in novelty sets, which contain rare earth element magnets that are many times more powerful than traditional magnets, have voluntarily asked consumers to return all their products after a Health Canada risk assessment found that they posed a danger to human health and safety. The federal department has also asked citizens to contact their municipality for safe disposal or recycling. ■

*Source: theprovince.com*

## THE FRIDGE IS WHERE MAGNETS BELONG

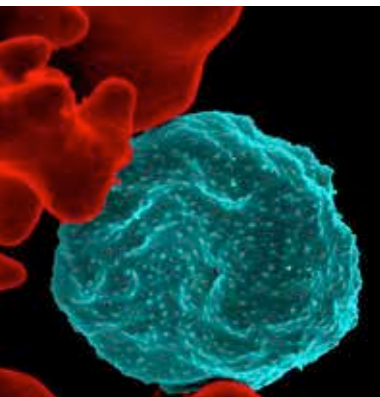
**A** recent poll by CBS News showed that more than eight in 10 Americans - 87 percent - have magnets on their refrigerator.

Thirty percent of Americans say they have more than 10 magnets on their refrigerator, 24 percent have between 5 and 10, while a third have fewer than that, including 6 percent who have just one on their fridge. ■

*Source: cbsnews.com*

Does your fridge have magnets? Click a picture and share it with us at [brainwave@ack-media.com](mailto:brainwave@ack-media.com)

## MALARIA PARASITES IN BLOOD STREAM DETECTED BY MAGNETIC LASER



*Electron micrograph of red blood cell infected with malaria parasites (blue)*

**D**id you know that malaria parasites eat the hemoglobin in red blood cells, but cannot digest or excrete the iron in them?

Using this information, a student-professor team at Case Western Reserve University has invented a handheld malaria detector that will identify the iron innards of the parasites in our blood and alerts us!

The team has incorporated itself as the Disease Diagnostic Group, and is now seeking investors who will pay for field tests.

The Disease Diagnostic Group claims that their test is far more accurate and cost-effective at detecting low-level infections than any of the current kits. All they need are fridge magnets and laser light! ■

*Source: nytimes.com*



# Magnetism demystified

by Priyanka Talreja

*Dinesh comes face-to-face  
with magnetism!*

Artwork: Sarthak Sinha

**A**fter a hard day at school, Dinesh was quietly walking back home, head stooped. He could barely look up. His dad, the great scientist and inventor of the time travelling machine Mr. Kumar had left on a journey. This had left him in a complete fix.

Mumbling to himself, he kicked a stone. Taanggg! It went and hit a metal dust bin. Dinesh broke out of his trance and looked up. Out of nowhere, he was standing right in front of a gigantic complex-looking building. He was... lost?! He had never seen this place on his way home before. "How can it be," he asked himself, "that there is such a huge building in my area without me knowing it?"

Being the curious kind, he walked right in. As soon as he entered, he saw what looked like a huge person with no arms and legs, seated on a sofa. Whatever it was, it looked awfully intimidating.

"Who are you?" a brave Dinesh inquired. The figure turned and spoke in a polite tone, "Please have a seat."

"But who are you? Where am I? And how are you so huge?" persisted Dinesh, suspiciously.

The figure looked at him without an expression on its face and asked, "What's disturbing you so much? You were walking back home from school dejected."

Dinesh was now thoroughly confused. He tried to remember why he was so upset. It all came back to him suddenly and his shoulders stooped again. "I have a test tomorrow," he blurted out. "The topic is magnetism. I don't understand anything about it. I will fail, I'm sure! My dad's generally always there to explain concepts to me, but this time he isn't here."

"Well boy, why worry when I'm right here? Pleased to meet you. I am the force you call magnetism," said the figure.

Dinesh looked up, shocked, "Wha ... wha ... WHAT?"

"Yes. And now, you can ask me all the questions you would like to be answered. You have a chance to learn from magnetism itself!" exclaimed the figure.

Dinesh felt a jolt run right through him. He knew this could not be true. Was this a dream? He did not care. He wanted to solve the puzzle called magnetism. He quickly moved towards the sofa and took out his note pad.

He looked at the figure to ask his first question, but stopped midway, "But you look so huge and intimidating! Why?"

"Aha! This is because of you!" replied magnetism. "The way I appear to you is inversely proportional to your understanding of me. You will see me change, and become less intimidating and more friendly as you begin to know me better. But for that, you have to ask the right questions!"

All this seemed too exciting to Dinesh. He just could not wait any longer. "Really? Let's start then!"

"Fire away!"

**"So tell me, what is a magnet?"**

"A magnet is any object that has its component atoms aligned in an order such that they produce a magnetic field. They can be natural or manmade," answered the figure simply.

**"And what is a magnetic field?"**

"Magnetic fields are areas within which magnets exhibit influence. These are invisible lines of force that surround any magnet! These cause attraction or repulsion towards other objects based on the alignment of their component atoms," replied magnetism.



### **“Who invented magnets and how?”**

“Well, the first magnet was not made, but discovered. It was found in a naturally occurring mineral called magnetite. Traditionally, the ancient Greeks were the discoverers. How they discovered it, stories are many. The most popular and entertaining legend states that an elderly shepherd named Magnes was herding his sheep in an area of northern Greece called Magnesia about 4,000 years ago. On that trip, both the nails in his shoes and the metal tip of his staff was stuck firmly to the large, black rock on which he was standing. This type of rock was subsequently named magnetite, after either Magnesia or Magnes himself,” explained the force with a chuckle.

### **“I know that electricity and magnetism are related. But, how?”**

“Now that is the right question. If you look closely, you will find that electricity and magnetism are like conjoined twins! The discovery of magnets is of great significance since magnets are needed to generate electricity. Imagine the things you would not have access to, without electricity - phones, lights, computers, TVs ... all gone ... poof!”

As soon as Dinesh digested this information, the huge intimidating magnetism transformed a little, taking a slightly smaller and more pleasant form. Dinesh was shocked. A little scared, he quickly asked the next question.

### **“How do magnets help produce electricity?”**

“Electricity is produced by generators. Each power station has generators that convert mechanical energy to electric energy.

It’s magical how generators do this! Imagine that you have a magic wand. You spin it

in a circular fashion. Once you start doing that, the air gets pulled towards it and starts spinning. Generators do just that!

A generator is made up of large magnets wrapped in coils of wire. When the magnets spin, they attract electrons in the wire and make them flow in a current, which is passed on via the coils.

Generators spin with the help of different resources like coal, fuel, wind, water, etc.”

“Is it really that simple?” asked a surprised Dinesh.

“It sure is!” exclaimed magnetism, and transformed yet again, to look a bit like a human girl.

### **“Ok. but, do we really need to study magnetism? Do we really need magnets?”**

“I can feel the buzz now!” humoured the mysterious force. “Magnets have a more important role than just generating electricity. An example is information storage. Your credit cards, floppy disks, and the hard disk in your computer remember the information you entrust to them in the form of a pattern of magnetization - i.e. many little regions that are magnets pointing one way or another.

Magnets are installed in everything containing an electric motor or a cooling fan, from the washing machine to the hair dryer, from the kitchen blender to the fridge. Loudspeakers and microphones contain magnets too. And if you own a modern car or a smartphone, they will almost certainly be packed with magnets.”

**“Hmm...ok,” muttered Dinesh, in thought.**

Magnetism continued, “Magnetism is also one of the oldest technologies to have



transformed from being a science toy to a world-changing application. That application was, of course, the magnetic compass. Its introduction at the end of the 12th century had a dramatic effect on the development of European exploration and colonization.

Human beings have studied magnetism for three thousand years. They have been using magnets for many centuries. They certainly need magnets for an amazing number of applications, and to produce the power that sustains their civilization."

And with this answer, magnetism turned into a girl of Dinesh's age.

"Well, now I am your friend. You have learnt all the basics and asked the right questions. See! I am not that complex or intimidating," magnetism said with a friendly smile.

Dinesh could not believe his eyes. He stood up to thank the girl, go home and prepare well for his test.

"Before we part, I would like to give you a gift," said magnetism and handed him a small note. "This note has some interesting information for you," she grinned.

And then, out of nowhere a jarring sound was heard ...  
Taannggg!

Magnetism was now in a sudden rush. "See you my friend," she said "I have to go now. Looks like it's time for another interview. All the best for your test!"

Before Dinesh knew it, he was standing right in front of the metal dust bin, staring at it. In the place of the building was his house!

"What just happened?" he thought, bewildered.

He looked down at the note magnetism gave him.

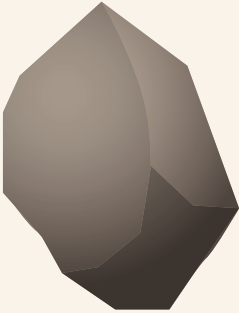
He opened it and read, "I might not be around at times, but can surely perform some amazing tricks to help you! – Love, Dad." ■



# MagnetHere, MagnetThere

If magnets had to be categorized, they would fall into two main types:

- Natural magnets
- Artificial magnets



## Natural magnets

Also known as lodestone, these are naturally-occurring magnets that can attract pieces of iron. These magnets are made up of the mineral magnetite. Found freely in nature, these are also the reason behind our ancestors discovering magnetism.



## Artificial magnets...

Fall into three major categories -

### Permanent magnets

**Once a magnet, always a magnet.**

The best sample of a permanent magnet is the one we use on our refrigerator, for decoration.

Once magnetized, these magnets retain a level of magnetism and create their own persistent magnetic field.

Examples of permanent magnets include:

**Alnico** - an alloy mostly comprising of aluminum, nickel, cobalt.

**Ferrites** - ceramic-like material that is made from a mix of iron oxides with nickel, strontium, or cobalt.

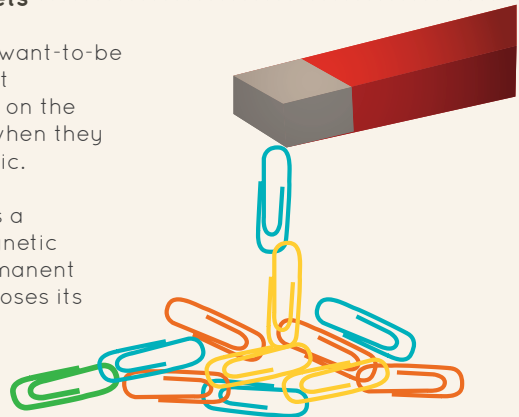


### Temporary magnets

**I feel the field, I ape you.**

Temporary magnets are want-to-be magnets. This means that temporary magnets take on the properties of a magnet when they touch something magnetic.

A great example of this is a paperclip becoming magnetic when stroked with a permanent magnet. After a while, it loses its magnetism.

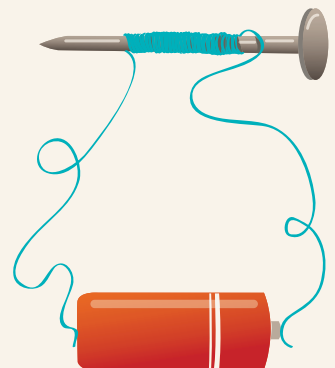


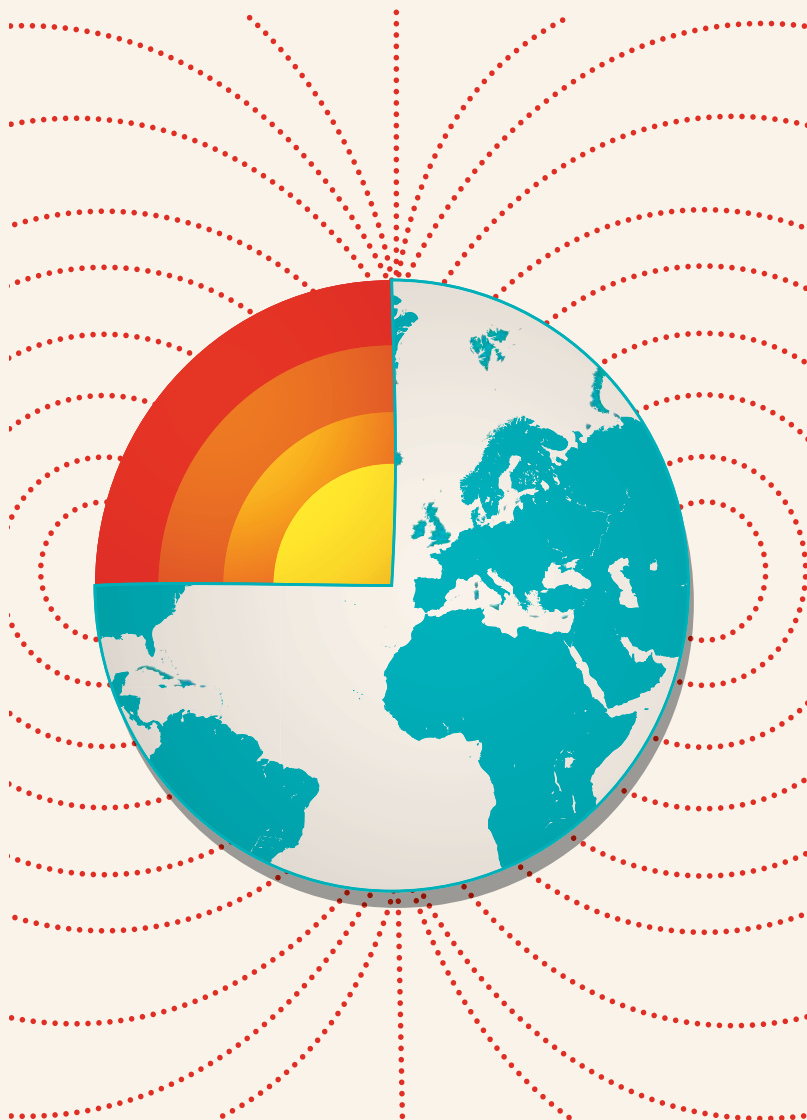
### Electro-magnets

**Charge me or I shall go.**

An electromagnet is a tightly wound coil of wire, usually with an iron core, which acts like a permanent magnet when current flows in the wire. The electricity going through the wire produces a magnetic field.

The strength and polarity of the magnetic field can be adjusted by changing the magnitude of the current flowing through the wire, and by changing the direction of the current flow. Most computers, televisions, and electric motors use electromagnets.





Here are some interesting facts about the Earth's magnetic field:

- The Earth's magnetic and geographic poles are not the same. Odd!
- The Earth's magnetic field produces beautiful patterns of natural light over the magnetic poles of the northern and southern hemispheres. They are known as 'Aurora borealis' in the north and 'Aurora australis' in the south. Beautiful!
- There are actually two pairs of magnetic poles. The 'magnetic poles' are the two positions on the Earth's surface where the magnetic field is entirely vertical. Weird!
- The Earth's magnetic poles are not at directly opposite positions on the globe. Crazy!
- The magnetic poles move around over time. On an average, about every 300,000 years, the Earth's magnetic field reverses itself. Spooky!

## The Biggest Magnet Ever

Do you know which is the biggest magnet we know about?

Here's a hint - it is so big that it can be seen from outer space! Well, it is the Earth!

Yes, our Earth is a big magnet pulling everything towards it. Like all forms of magnetism, the Earth's magnetic field is produced by electric currents.

How these currents are produced is not known for certain, but one dominant theory is that deep in the Earth's core, hot molten magma rises, cools and sinks and this is a continuous process that keeps repeating. It is thought that within these rising and falling masses of magma, the rotation of the Earth creates organized patterns of circular electrical currents, called eddies.





# THE TIME TRAVELLING KUMARS

Episode 10

Sherlock  
Diaries  
4

Story by:  
Sasikanth.C

Artwork by:  
Sarthak Sinha

In the previous issues, we have seen Dinesh get separated from his parents during their time travelling adventures and land in the early 20th century London, meeting Sherlock Holmes in 221B Baker Street.

221B  
BAKER  
STREET

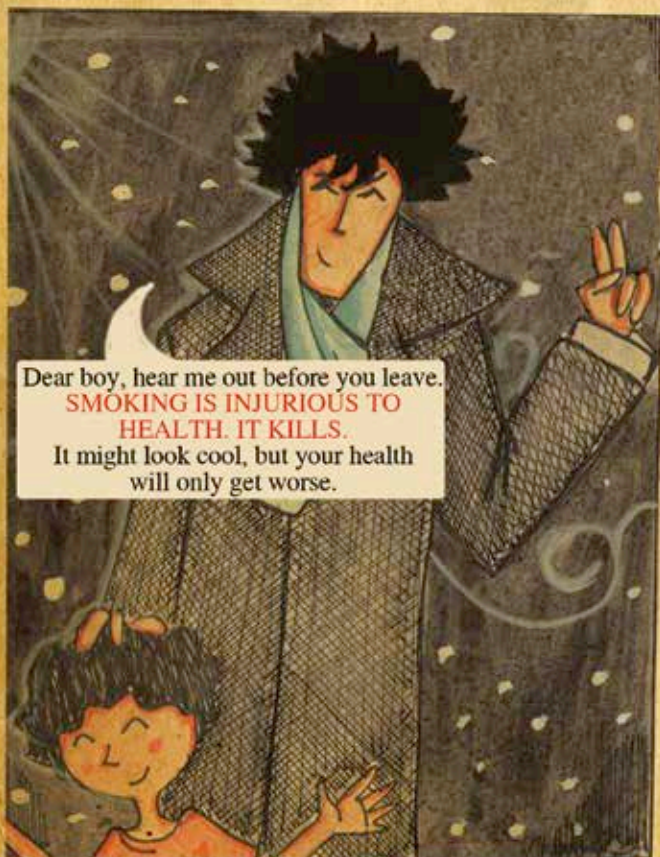


Being an ardent fan of the world's first and greatest science detective, Dinesh is overwhelmed and quizzes Sherlock Holmes relentlessly, about his methods and experiences. He also gets to watch Holmes in action - helping Inspector MacDonald solve a mystery without moving from his armchair.



Now, please leave me alone for a while. I have some serious thinking to do.

Righto Mr. Holmes. I will go out for a walk. I have heard that London is beautiful and has an amazing weather.



Dear boy, hear me out before you leave.  
**SMOKING IS INJURIOUS TO  
HEALTH. IT KILLS.**  
It might look cool, but your health  
will only get worse.



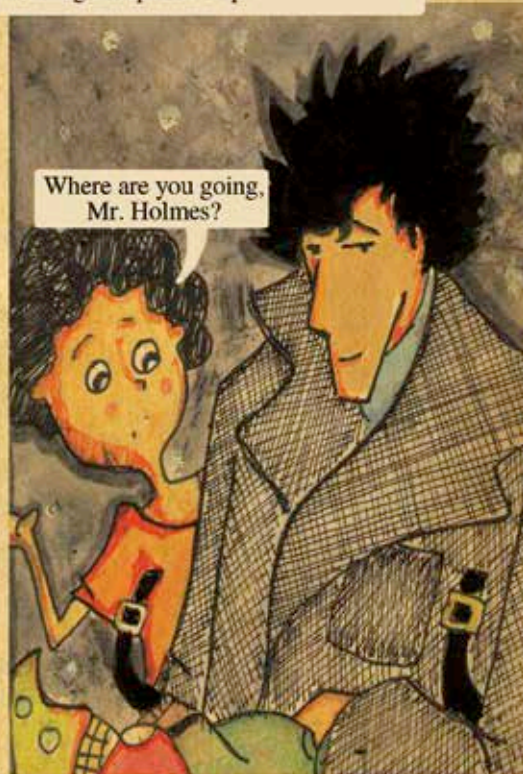
Well ... then,  
why do you  
smoke,  
Mr. Holmes?  
I have seen  
you smoking  
non-stop  
since I have  
arrived here.

Yes, a misfortune ... we'll discuss it later.



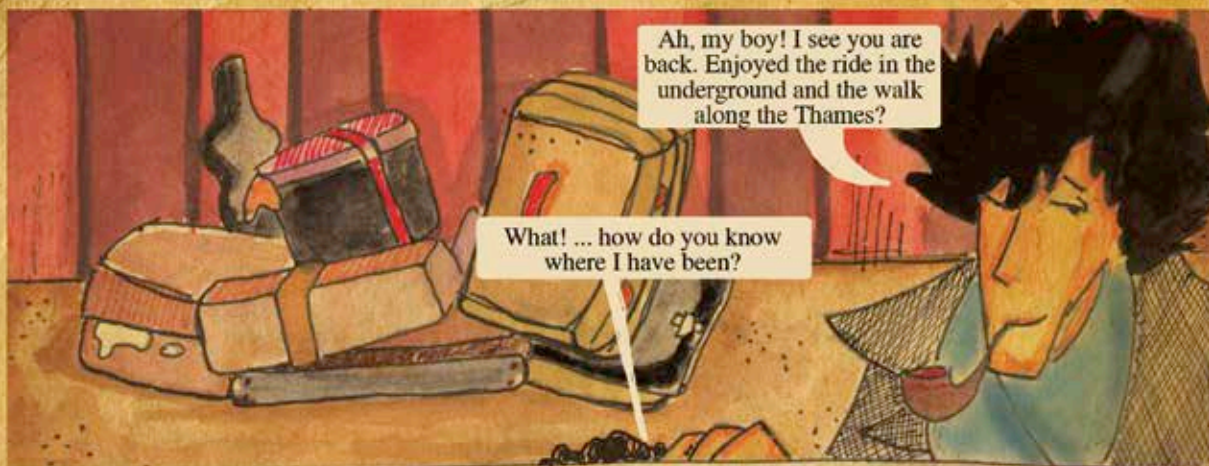


After enjoying the beauty of London, Dinesh enters 221B again, only to see Sherlock Holmes packing and clearing the quarters up.



Where are you going, Mr. Holmes?





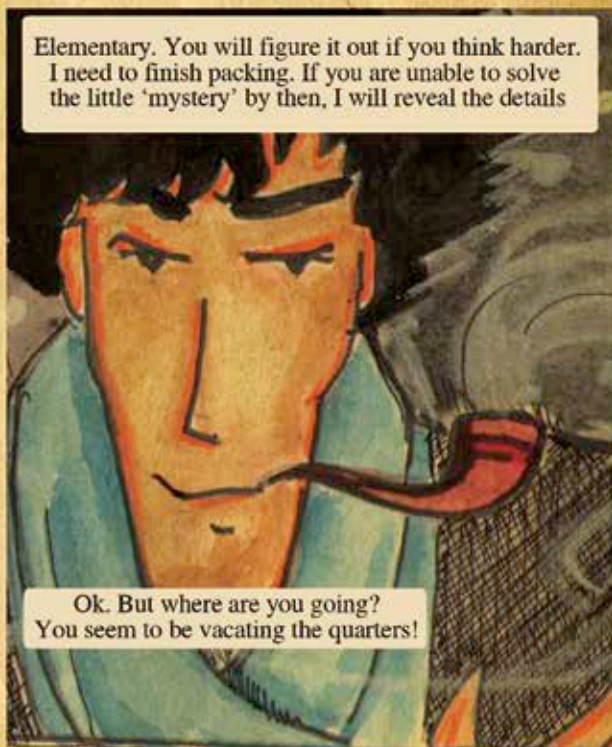
Ah, my boy! I see you are back. Enjoyed the ride in the underground and the walk along the Thames?

What! ... how do you know where I have been?



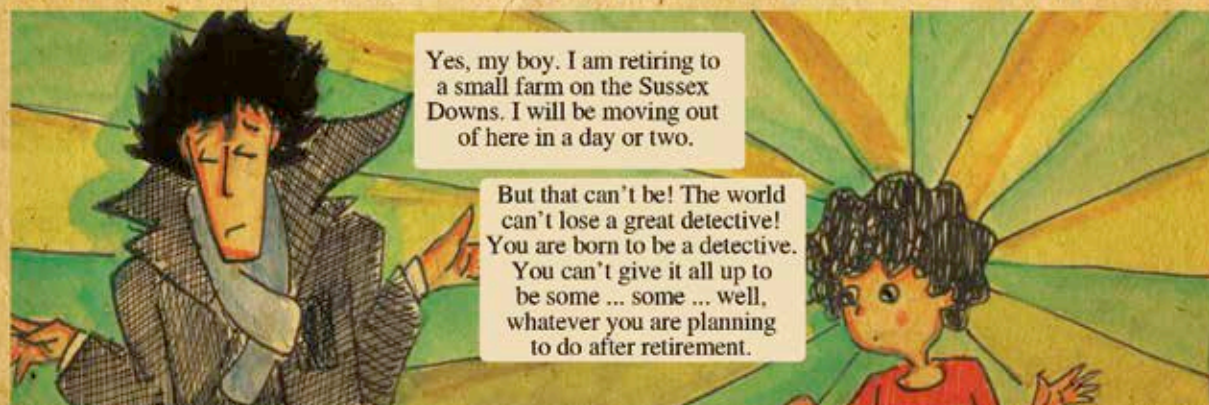
How indeed! My boy, you know all about my methods. Do I need to still explain myself to you?

Please tell me Mr. Holmes. I am unable to understand how you might have deduced that.



Elementary. You will figure it out if you think harder. I need to finish packing. If you are unable to solve the little 'mystery' by then, I will reveal the details

Ok. But where are you going?  
You seem to be vacating the quarters!



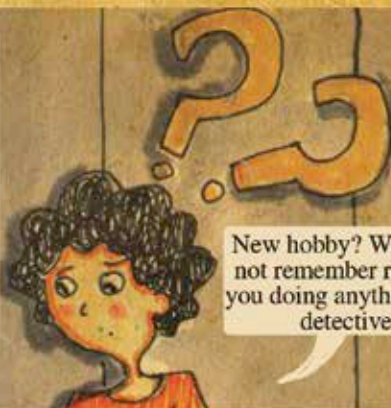
Yes, my boy. I am retiring to a small farm on the Sussex Downs. I will be moving out of here in a day or two.

But that can't be! The world can't lose a great detective! You are born to be a detective. You can't give it all up to be some ... some ... well, whatever you are planning to do after retirement.





I have given it a great deal of thought, my boy. It has been more than 20 years since I turned a professional detective. And without Moriarty, the challenges I have been facing are not that great. Scotland Yard will be able to do well enough without me. so, I intend to take up a new hobby.

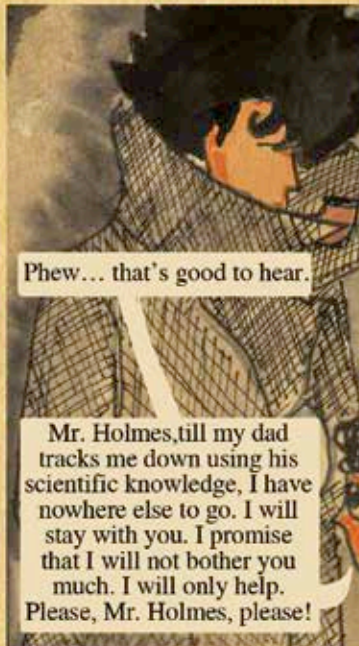


New hobby? What is it? I do not remember reading about you doing anything other than detective work.



Beekeeping. I am going to take it up as a primary occupation. I plan to write a book on the subject - *Practical Handbook of Bee Culture, with some Observations upon the Segregation of the Queen.*

But.. but..



Phew... that's good to hear.

Mr. Holmes, till my dad tracks me down using his scientific knowledge, I have nowhere else to go. I will stay with you. I promise that I will not bother you much. I will only help. Please, Mr. Holmes, please!

Relax, boy. I am not giving up on my detection prowess. I will definitely take up cases that befit my intellect. As of now, I only see petty cases like that of Inspector MacDonald's. I better get busy with something else, and hope that some great cases come by.



Certainly, my boy, certainly. But on one condition.



Anything, Mr. Holmes. Just let me know.



Well, you need to deduce how I knew that you travelled by the London underground rail system, and visited the Westminster Abbey. If you can do it right, you can come with me.

Will Dinesh succeed? Will he accompany Sherlock Holmes to his retirement home? Read the next issue to find out.

In the meanwhile, email your guesses to [brainwave@ack-media.com](mailto:brainwave@ack-media.com) and get the chance to lay your hands on the Smarties comic e-book a good one month before it hits the stands!



# LIKE ROBOT, LIKE HUMAN.

by Nidhi Deshpande,  
Age 12



Artwork: Parvati Pillai

I wondered what to do. I wanted to prove that Ruby wasn't the only one who could build a brilliant robot. She had built a robot dog that could do anything a real dog could do. It was soft and fluffy as well!

I set out to build my own robot. I wrote a program that had emotional and psychic abilities to make the robot behave like a real person. Of course, I had copied all my memories into the program so that the robot could behave exactly like I do. I wrote this onto a chip which had unlimited memory. Now all that was left to do was find a body for my robot.

At night when everyone was asleep, I stole my sister's doll. I worked on it all night and transformed it into a robot that looked just like me. It could move every part, talk and behave like a real person! The head functioned as a solar panel. I left it out in the balcony for it to gather enough power from the morning Sun.

When I got up in the morning I found my sister screaming, "You played with my doll all night and then left it in the balcony. You are mean!" She picked the doll up and it said, 'Hello!' That was enough for my sister to freak out and decide to never touch it again, which was what I wanted too.

I called up Ruby using my telepathy-phone and asked her to meet me at the park in the evening. "What's up? It is not as if you could build a robot that is better than mine," she mocked me, while agreeing to meet up.

Little did she know that I could, indeed, build something that was ten times better! Imagining Ruby's reaction when she sees my robot, I began flying to school. ■

Write a superhero science fiction story in not less than 150 words and email it to us at [brainwave@ack-media.com](mailto:brainwave@ack-media.com). Two best entries get to win two Wolverine DVDs from Toonz Entertainment and Excel Home Videos.





Winners of July 2013 issue are:

Toy Box: **G Udit**

Ask Us Why: **Arushi Joshi**

Fan Fiction: **Varun S Girimaji**

Eye See: **Amarnath R**

Third Law: **Kanimozhi Kamaraj**

Planet Ninjas: **Mahesh Goud**

Magic Science: **No winner**

Sci-Q Time: **Yashvi Jaju**

Treasure Hunt: **Vijay Shukla**

Fun-do Band: **No winner**

**Shobika** and **Arthy** get nominated for the BW Student Board - [www.bwmag.in/student-board](http://www.bwmag.in/student-board)

The BW Smartenstein title, certificate and mystery gift for March go to **Roshan Warriar** - [www.bwmag.in/category/bw-smartenstein](http://www.bwmag.in/category/bw-smartenstein)

All Fun-do Band captains - ensure that each of your team members visits and registers individually at [www.bwmag.in/fun-do-band](http://www.bwmag.in/fun-do-band) Your team membership will be activated only after that. If you face any issues during the process, write to [brainwave@ack-media.com](mailto:brainwave@ack-media.com)

May 2013 winners will be declared in the July 2013 issue.



## Letters from Readers

I read the article 'Intricate Ecosystem' just now. It was awesome! It talks about how different things changed Xavier. You really are right ... Government will not increase prices unless they have valid reasons ... It also explains about how villages are filled with love ... and what will happen if the trees in villages are cut down. As the prices of LPG have gone up, many villagers can't afford LPG anymore. So, Government and villagers should create alternative sources. Every village, town and city must allot some percent of land to growing Trees. This will reduce many problems. Great work by Brainwave team. This article got me addicted to your magazine. Continue this work!  
*Yashovardhan. via email*

Dear Yashovardhan,

We are happy to receive the email from you. Now that you are addicted to Brainwave, we hope to see many more emails from you. A science fiction story too, probably?  
SK, Editor

I really loved the July 2013 issue and want to tell you that I just missed my June 2013 issue. Please send me a soft copy of that. And the video - Deep Sea Diver on YouTube is a little complicated to me. Please tell Mr. X to explain it more and I would love if you answer the burning question that I am emailing to you for *ask us why?*

*Vidhu Raturi, Via email*

Dear Vidhu,  
Sent you the soft copy of the June 2013 issue. Hope you enjoyed it. Have you tried making your own Deep Sea Diver? Most things seem complex till you try them out. Do that and email me your specific observations and questions. I will ensure that Mr. X answers them promptly :)

Many English language words we use today are derived from Latin. It is the same with science. It is derived from the Latin word *scientia*, which means 'knowledge'.  
SK, Editor.



# PULL THE SPILL

by Priyanka Talreja

*When there is an oil spill, does the marine life have to die an untimely death? Nun-uh, that idea is history. Now, magnets will not only pull the oil out of the sea water but also enable reuse!*

Image Source: flickr

**A**n **oil spill<sup>G</sup>** is the most unfortunate occurrence for our marine and coastal ecosystems. All creatures living in the sea get surrounded by black slime and suffer with it till the very end. But, researchers from the Massachusetts Institute of Technology (MIT) now claim to have found a method of pulling out the oil after a spill, using magnets!

We all know that on its own, oil is not magnetic. The MIT researchers have discovered that when mixed with water-repellent nano-particles that contain iron, the oil can be magnetically separated from the water.

The process is interesting. It begins with the polluted sea water being pumped onto a boat treatment facility.

- Once onboard, the magnetic nano-particles would be added to this water.
- These particles would attach themselves to the oil.
- Once the nano-particles get attached to the oil, the liquid is filtered with magnets.
- The magnet would attract the nano-particles along with the oil, separating the oil from water.
- The water would be returned to the sea and the oil would be carried back to a refinery.
- Here, the nano-particles would be removed from the oil to enable the reuse. Thus, the oil gets separated from the sea-water and can be reused! ■

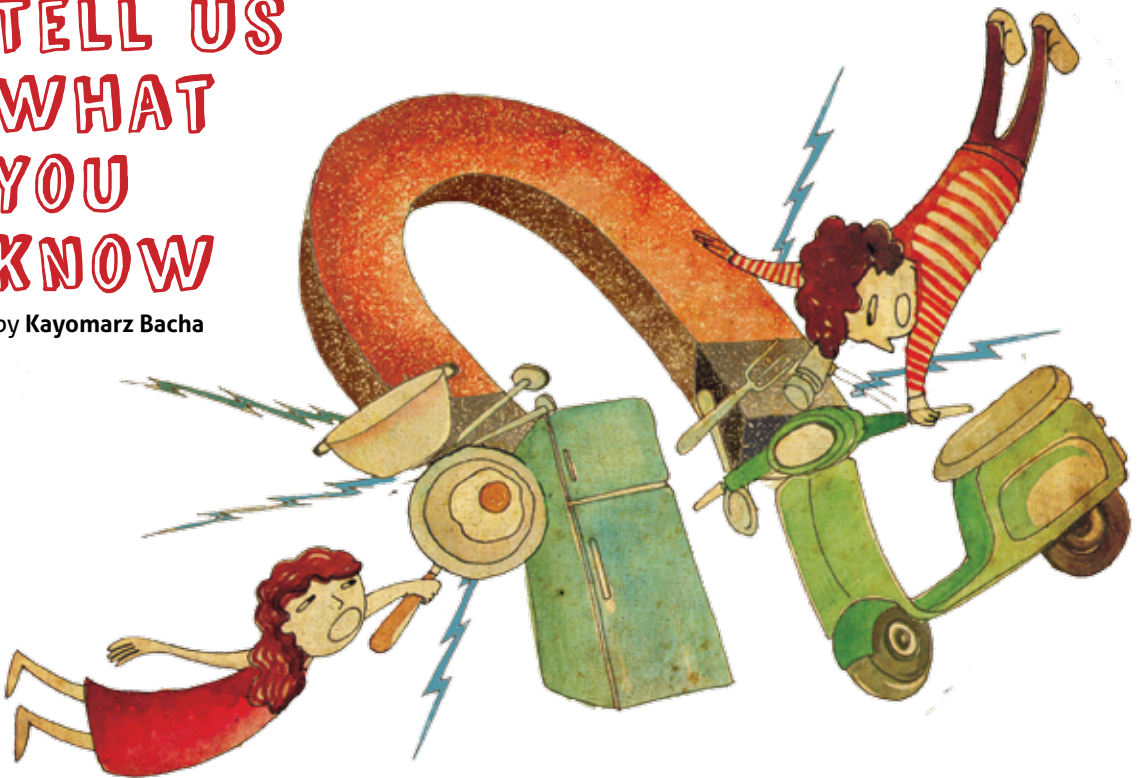
How do oil spills harm our ecosystems? Research and email us at [brainwave@ack-media.com](mailto:brainwave@ack-media.com) to win a nomination to our Student Board and a surprise gift!



# TELL US WHAT YOU KNOW

by Kayomarz Bacha

Artwork: Saudamini Tamboy



*We all know that magnets are bodies that produce an external magnetic field, and attract certain metals.*

**W**e also know that magnets are of different types.

- 1 Permanent
- 2 Temporary
- 3 Electromagnets

But, can you give examples for each type and their practical application? Research and email your answers to [brainwave@ack-media.com](mailto:brainwave@ack-media.com)

NOTE: Any answer copy pasted from the internet will be immediately disqualified. ■

The most original answers will win two cool ACK comic books!

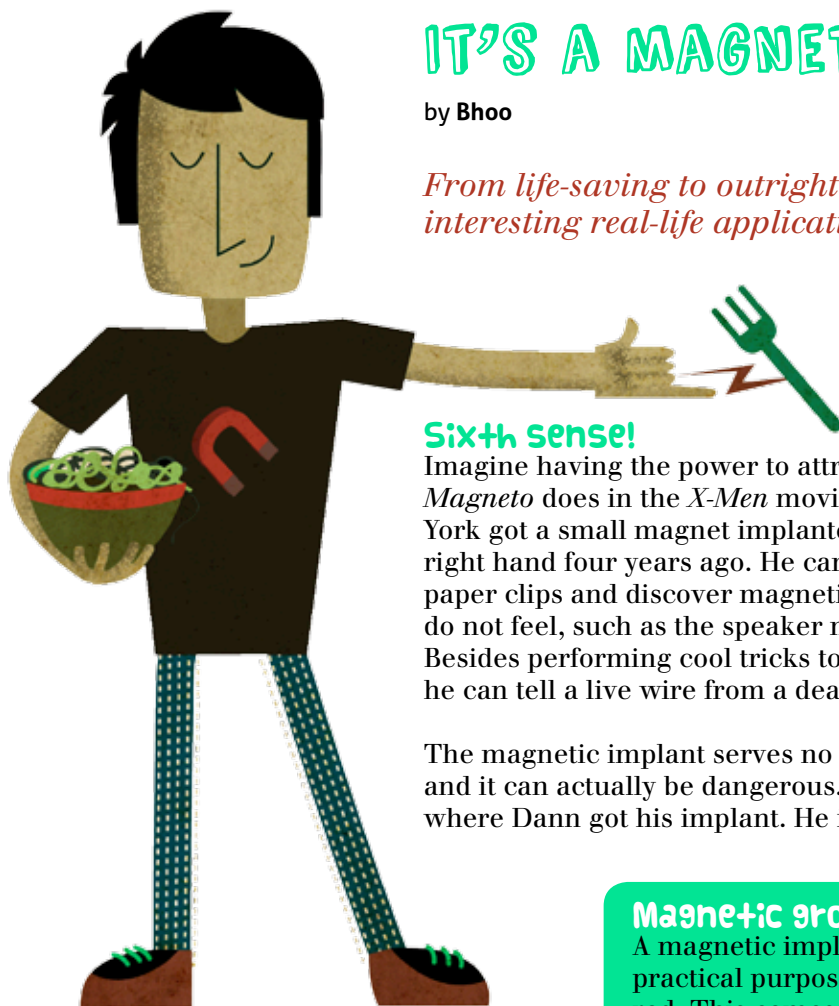




# IT'S A MAGNETIC WORLD

by Bhoo

*From life-saving to outright bizarre, here are some interesting real-life applications of magnetism.*



## Sixth sense!

Imagine having the power to attract metallic objects, like *Magneto* does in the *X-Men* movies. Dann Berg from New York got a small magnet implanted in the pinkie finger of his right hand four years ago. He can attract small objects like paper clips and discover magnetic fields that we otherwise do not feel, such as the speaker magnets of your phone. Besides performing cool tricks to amuse friends at parties, he can tell a live wire from a dead one!

The magnetic implant serves no practical purpose, though, and it can actually be dangerous. And do not try to find out where Dann got his implant. He isn't telling anyone! ■

Artwork: Saudamini Tamboy

## Bicycle lights

Bicycles are a great form of eco-friendly transport, and cycling is a good exercise too. But cycling in the dark is not safe. Dynamo bike lights were quite the rage some years ago, but those come with their own set of disadvantages like slowing the rider down due to friction and not generating enough power. Enter the magnetic bicycle light, a tiny one-piece device that can simply be mounted on your bike with no contact with the wheel at all! It uses eddy currents of the wheel to light itself up - no batteries or wires, just free and easy light! ■

## Magnetic growing rods

A magnetic implant that does serve a very practical purpose is the magnetic growing rod. This comes as a blessing to children suffering from a rare disease called early-onset Scoliosis. Their spines are deformed due to this, leading to bent backs like that of old people.

Generally, for children with this condition, doctors surgically place growing rods near the spine to support the back. But, they need to operate on the children almost twice every year, as they grow taller. Now, doctors can implant magnetic rods near the spine to prevent it from bending. The fascinating part is that, as children grow, doctors can lengthen these implants using remote control - so, children do not have to get operated upon every year! ■



Artwork: Sathak Sinha

## Be a Smartenstein!

We run more than ten activities and contests in each issue. They can win you many exciting prizes.

Participate in all the activities of an issue, and you can win a merit certificate, the title 'Smartenstein' and a mystery gift - every month!

There are more than 10 activities and contests in this issue. Turn to the index on [p02](#), check the features marked with a '★' out, and participate in them.

What are you waiting for? We have even introduced a contest by Cartoon Network that gives you cool gifts - on [p07](#)!

[www.bwmag.in/category/bw-smartenstein](http://www.bwmag.in/category/bw-smartenstein)

Join us on our fun-do video channel as *Mr. X* performs some amazing experiments and *x-plains* the science behind them.

Mr. X will perform and publish your experiments too! Just email them to [brainwave@ack-media.com](mailto:brainwave@ack-media.com)



[www.youtube.com/Brainwavemag](http://www.youtube.com/Brainwavemag)

Artwork: Abhijeet Kini

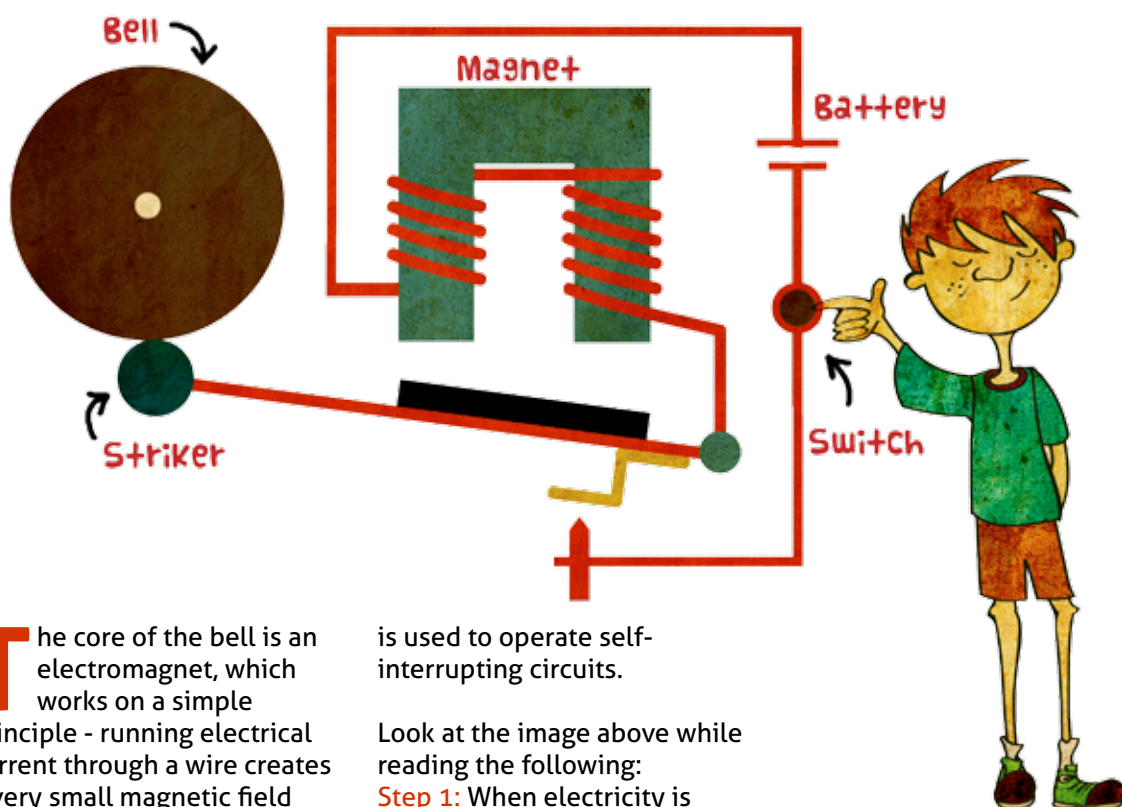


# Ting Tong!

by Pushkar Samant

*Have you ever eagerly waited for the school bell to ring and school to end? Ever wondered how the bell rings? Actually, it is the magical magnet inside the bell that rings it. Let us understand how it works.*

by Pushkar Samant



**T**he core of the bell is an electromagnet, which works on a simple principle - running electrical current through a wire creates a very small magnetic field around the wire. Coiling the wire amplifies this magnetic field and it has a substantial effect on any magnetic objects around it.

The magnetic field of an electromagnet has a polar orientation - a 'north' and a 'south' end - and attracts metals like iron. In school bells as well as buzzers, this electromagnet

is used to operate self-interrupting circuits.

Look at the image above while reading the following:

**Step 1:** When electricity is passed through the school bell, the electromagnet is activated.

**Step 2:** The electromagnet attracts the striker, which hits the gong.

**Step 3:** When the striker moves to hit the gong, the electric circuit is broken and the electromagnet is shut off.

**Step 4:** Then, the hammer falls back into its original position, closing the circuit again, and

letting electricity pass through.

**Step 5:** The process repeats as long as the switch is on.

The buzzing noise you hear is the sound of the rapidly moving hammer hitting the magnet dozens of times a second. So, the next time you hear your school bell ring, say hello to magnetism. ■





# See the Invisible

by Sasikanth C

*Magnetic fields generated by magnets are invisible. Or are they?*

**H**ere is a cool trick that you can do to view magnetic fields:

- 1 Take a bar magnet.
- 2 Roll it in lot of sand at any construction site near your home. The magnet will attract iron particles. Collect a handful of such particles.
- 3 Place the bar magnet on a table and place a clear white sheet of paper over it.

- 4 Slowly, sprinkle the iron particles on to the sheet, pushing them around with your fingers. ■



What do you see? Why does this happen? What happens when you use a round or a 'U' magnet? Email your answers to [brainwave@ack-media.com](mailto:brainwave@ack-media.com). The most original response can win you a cool ACK comic book!

**Now, get  
more  
bang for  
your  
buck!**

Visit  
our website  
for more  
content  
every month  
- exclusive  
for our  
subscribers!

Visit [www.bwmag.in/category/web-only-articles](http://www.bwmag.in/category/web-only-articles)

# James Maxwell read the magnetic spell

by Priyanka Talreja

**J**ames Maxwell - does the name sound familiar? If not, now is a good time to get to know him better! Back in the nineteenth century many discoveries were made. But, no one was able to mathematically explain the relation between magnetism and electricity till James Maxwell came along.

In 1865, James Maxwell moved to Scotland and decided to devote himself to research and writing on electricity and magnetism. Maxwell was inspired by the famous English physicist Michael Faraday who had invented the electric generator that used a moving magnet to produce electricity. Faraday had also demonstrated that an electric current produced magnetism. James Maxwell's sole aim was to produce the mathematical framework that would authenticate Faraday's experimental results.

During his research, Maxwell calculated the speed of electromagnetic waves and found that their speed was virtually the same as the speed of light. This made him conclude that light was nothing but a type of electromagnetic wave.

Eventually, Maxwell formulated four mathematical equations that are now regarded as the most fundamental contributions to physics. These equations demonstrate that electricity, magnetism and even light are all manifestations of

the same phenomenon: electromagnetism.

Today, most communication technologies have their roots in Maxwell's work - radio, television, radar, satellite communication and many more. ■



Image Source: Wikimedia commons



# Stuck on Science!

by Prachi Shah

*They may have numerous fans, but these celebs are strongly attracted to the magnetic charm of science!*

## Abdul Kalam

Being a scientist himself, it's no wonder that Dr. APJ Kalam always promotes science and technology, especially to India's young generation. Apart from proposing and researching new breakthroughs, he makes it a point to interact with students across the country, an activity which he carried out even as the President of India.

Space-based solar power<sup>G</sup> finds a staunch enthusiast in Kalam. Hence, it's no wonder that after he visited China in 2012, there were talks of both countries coming together and developing a solar power satellite. Way to go, Dr. Kalam! ■



Artwork: Kashmira Sarode

## William

Although this Black Eyed Peas singer has made a life out of music, he truly believes that science is very important. He vehemently promotes *STEM* – Science, Technology, Engineering and Mathematics – knowledge. Putting his mind where his heart is, he has contributed in developing certain smartphones, laptops and tablets for which he was crowned the Director of Creative Innovation at Intel in 2011.

He is also an avid supporter of *FIRST* (For Inspiration and Recognition of Science and Technology), and was awarded the *Make It Loud Award* in 2013 for helping raise awareness about the organisation. ■

## Natalie Portman

Even though she rocketed to fame while she was still studying, Natalie Portman remained loyal to science which was evident when she missed the premiere of her film *Star Wars Episode 1* in order to study for her exams.

While acting in films, she finished her bachelor degree in Psychology, co-authored two research papers which got published in scientific journals and even contributed in a memory study as a student. One of her papers reaching the semi-final stage of the Intel Science Talent Search, one of the toughest and most prestigious high school competitions in the US. Now that's what we call a celebrity scientist! ■



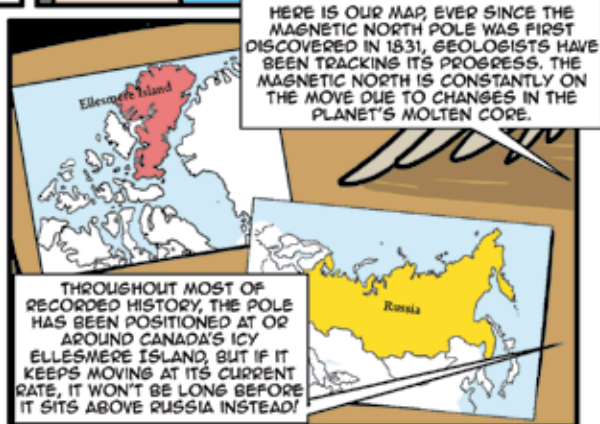
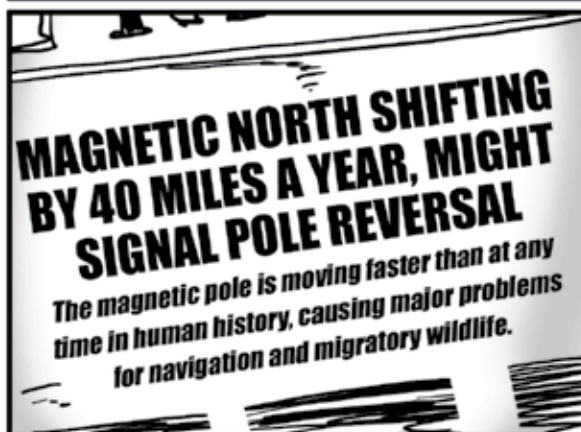


# THE SMARTIES

## THE POLE STORY

STORY: PRIYANKA TALREJA

ART & LETTERING: ABHIJEET KINI





YES, I READ THAT! THE TAMPA INTERNATIONAL AIRPORT IN FLORIDA HAS JUST SPENT A MONTH RENAMING ALL OF ITS RUNWAYS, WHICH ARE NAMED AFTER THE DIRECTION AT WHICH THEY POINT ON A COMPASS! SIMILAR CHANGES WERE RECENTLY MADE TO RUNWAYS AT FORT LAUDERDALE AND PALM BEACH. NOW, ACROSS THAT COUNTRY RUNWAYS NEED TO BE RENAMED AT LEAST ONCE EVERY FIVE YEARS!



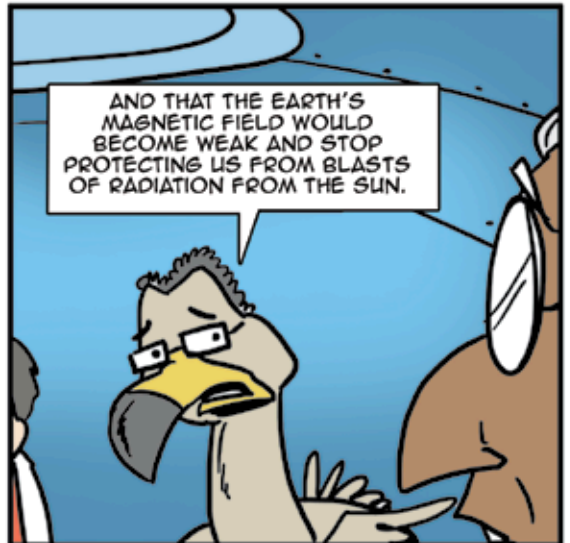
THE REVERSAL GENERALLY TAKES 1000 TO 10,000 YEARS TO HAPPEN. BUT NOW, IT IS HAPPENING SUPER FAST.



SPECULATORS SAY THAT WHEN THIS HAPPENS THE PLANETS WILL LURCH IN ONE DIRECTION, TRIGGERING EARTHQUAKES AND MONUMENTAL TSUNAMIS.



AND THAT THE EARTH'S MAGNETIC FIELD WOULD BECOME WEAK AND STOP PROTECTING US FROM BLASTS OF RADIATION FROM THE SUN.

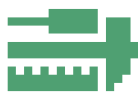


BUT SCIENTISTS SAY THAT MANY OF THE DISASTER SCENARIOS ASSOCIATED WITH GEOMAGNETIC POLE REVERSALS IN POPULAR IMAGINATION ARE PURE FANTASY, THERE DEFINITELY WON'T BE ANY BREAK-UP OR SHIFT OF THE CONTINENTS.



WHATEVER IT IS, OUR PLANET IS CHANGING. WE HAVE TO BE PREPARED FOR IT.





# ELECTROMAGNET WITH A SWITCH

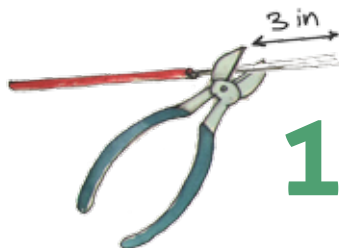
by Kayomarz Bacha

## You need:

- A thin, long uninsulated copper wire (approx 20 inches)
- A 3-inch iron nail
- Two D sized batteries of 1.5 volts each
- Wire cutter or blade
- Electric tape
- Paper pins
- Paper clips
- A small piece of cardboard

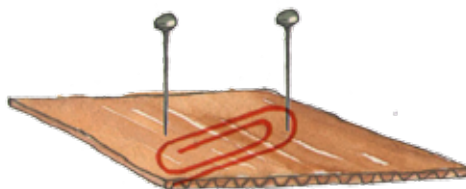


## METHOD:



**1** With the help of an adult, cut two 3-inch pieces of copper wire.

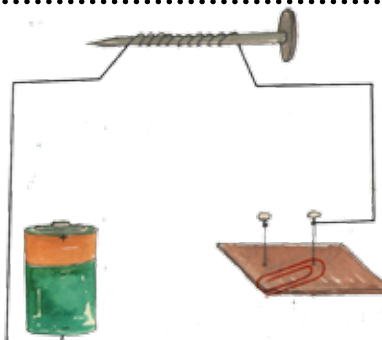
NOTE: If the wire you have is insulated, take the insulation off.



**2** Create a switch on the cardboard piece using a paper clip and pins, as shown here.

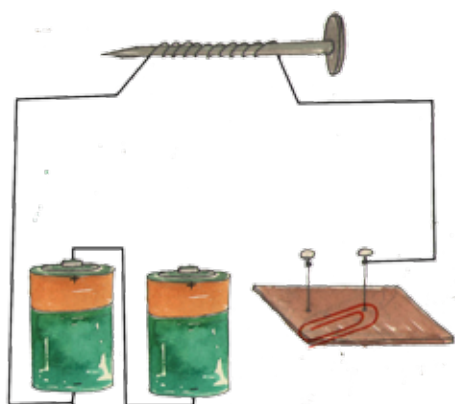


**3** Use the long piece of wire and coil it over the iron nail about 25–30 times.

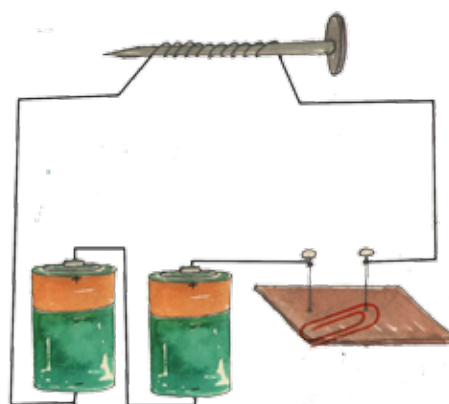


**4** Connect one end of the coiled wire to the switch and the other end to the -ve end of one of the batteries.

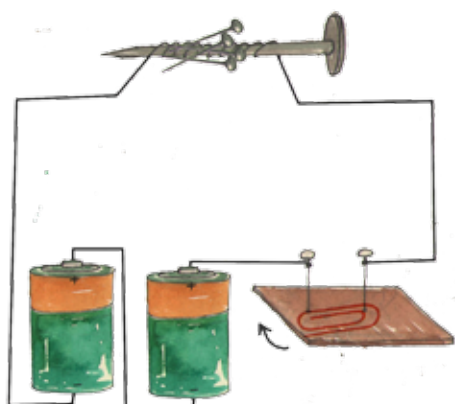




**5** Connect the +ve end of this battery to the -ve end of the other battery, as shown.



**6** Connect the +ve end of the second battery to the loose end of the switch, as shown.



**7** Your electromagnet is ready. You will be able to lift a few pins with the magnetized iron nail.

**Note:** Use the electric tape to secure the wire connections to the batteries.

## WHY DOES THIS HAPPEN?

When electric current passes through the wire coiled round the nail, it creates a magnetic field. When the wire carrying electricity is twisted into a coil, it is called a solenoid and generates a powerful magnetic effect inside the coil, creating an electromagnet.

The magnetic field inside the coil causes the tiny magnetic molecules in the nail to be aligned in one direction i.e all the north poles point in the same direction. These little 'magnets' add to the magnetic effect inside the coil and make the magnet strong enough to pick up tiny metallic objects. ■

What are eddie currents? Research and email your answers to [brainwave@ack-media.com](mailto:brainwave@ack-media.com). The best answer wins 2 cool ACK comic books!



## YOUR DAILY DOSE OF MAGNETS

*There are so many different ways in which we use magnets in our day-to-day life, without even knowing it. You might not have even heard about some of these!*

by Sasikanth C



### The most common examples are:

- Car and fridge doors
- Door hinges
- Blenders
- CD Players
- Computers
- Washing machines
- Printers
- Escalators
- Elevators
- Loud speakers
- Credit and Debit cards
- TVs and Radio sets
- Toys

Image Source: Wikimedia Commons

### Some things that would not work without magnets:

- Metal detectors
- Lifting heavy objects
- Separating metal objects from the rest, in junk yards
- Braking mechanism in roller coasters and trains
- Navigation systems
- Electricity generation
- Electric motors
- In the field of medicine, such as in magnetic therapy and **MRI<sup>G</sup>**
- **Particle accelerators<sup>G</sup>**
- Maglev trains that clock speeds above 300 miles per hour

These are, but a few examples. Can you think of more? Research and email your list to us at [brainwave@ack-media.com](mailto:brainwave@ack-media.com)



GRAPHIC  
NOVEL

# TIME GLIDERS

Copyright © 2013, Time Gliders. All rights reserved.



Join our team of time travellers from 2550 A.D.  
whose mission it is to discover and learn more about  
our Universe!

September 2013 37



# Meet the team



By 2550 A.D., time travel has been perfected.

This leads to the Time Glider project, run by a consortium of science and engineering departments from all over the world. The aim is to gain a better understanding of certain difficult, science-related issues. There are various Time Glider teams, but the first mission belongs to TG-1, the spacecraft commandeered by professor Patel.

Time Gliders Command has one directive: TG teams are assigned to discover and explore, but are under no circumstances allowed to interfere with human history. This may cause uncontrollable ripple effects that may jeopardize the very future existence of the Time Gliders agency!

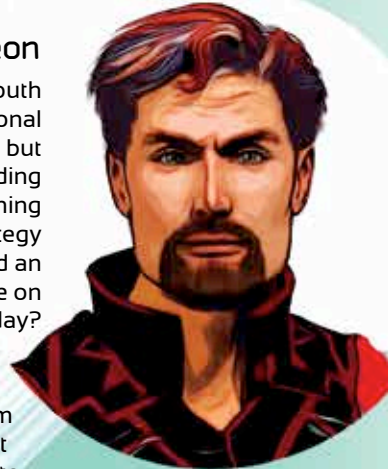
## Professor Patel

Commander of TG-1, and co-founder of the International Time Gliders Agency, he is commonly known as "Prof". Born in Kolkata, India, he boasts several Nobel prizes in the natural sciences. His specialty is quantum physics and string theory, frequently causing him sleepless nights. It is no secret that Prof loves hot curry, which, according to him, helps him "to think better".



## Deon

Pilot, and in charge of security. Born in Pretoria, South Africa, Deon is a new recruit from the International Space Flight Academy, and ready for adventure but tends to be somewhat impulsive at times, finding himself in dangerous situations. Deon loves anything that is fast. As a kid he was a champion in strategy games on the Play Station 999, and developed an interest in human history. Who knows, his knowledge on this subject might even come in handy someday?



## Liz

Engineer and data analyst. Born and raised on a farm in Australia, she loved helping her dad fix equipment rather than playing with dolls. She sometimes got into trouble at school after altering machines to "improve" them without permission! Liz developed a special interest in nanotechnology and endeavors to one day receive the Nobel Prize in this field.



## Quasar

Logistics and timeline navigator. Quasar is, well, basically from all over the world. He was conceived in a Japanese robotics laboratory, but developed further in India. Most of his parts are from China, but he was finally assembled in Germany. Having a limited capacity to experience human-like emotions, it is no wonder he is wrestling somewhat to find his own identity. Quasar has a special taste for Castrol lubricants as it helps keep his joints in tip-top shape.





To get a sleeping Deon's attention on the bridge, Quasar zapped him with an electromagnetic pulse from outside the craft.

Quasar! I will wring your neck until every last ball bearing has popped out! Is this your idea of a sick jo...

...b-boy - that thing's the size of a small planet!

Quasar, can you attach yourself to the hull?

No problem, I've got built-in electromagnets.

Do it! Aft thrusters - full power!

The TG-1 shoots out of the way as the huge object narrowly misses, passing right behind it..

Wow, that was too close to comfort! I can even feel the pull of that object's gravity! Maximum thrust!

Professor - I need you on the bridge ... asap!

See? It's headed for Earth! We need to do something to stop it!

A few seconds later...

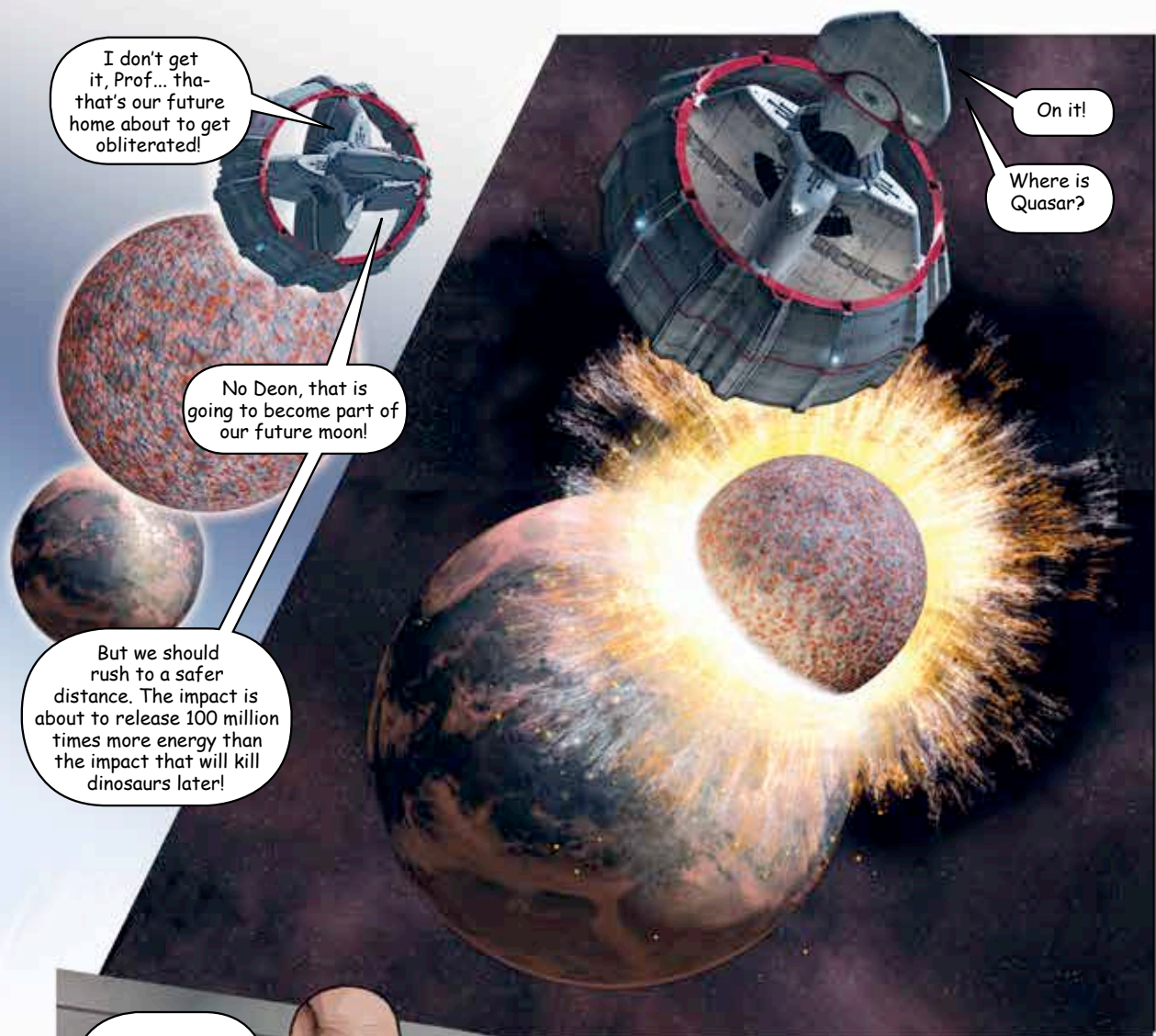
Hmmm ... no Deon. Let's leave it. This is likely a necessary "evil" about to happen.

You're joking ... right?

# TIME GLIDERS

Episode 3





I don't get it, Prof... that's our future home about to get obliterated!

On it!

Where is Quasar?

No Deon, that is going to become part of our future moon!

But we should rush to a safer distance. The impact is about to release 100 million times more energy than the impact that will kill dinosaurs later!

He is hanging on to the ship ... I think. Quasar, are you still there?



Affirmative, sir, I'm having the ride of my life!

I should have left that robot out there, after what he did to me! He could have done something else to wak ...

What?



Err ... nothing .. nothing important.





As Quasar returns to the TG-1, professor Patel continues to explain the moon phenomenon.

All-right, hologram on! That planetoid (let's call it Theia) that just hit Earth, is not the actual Moon, but the collision is going to contribute to its formation.

You see, that impact just vaporized the Earth's outer mantle and melted both bodies.

A portion of that mantle was ejected into an orbit around it.

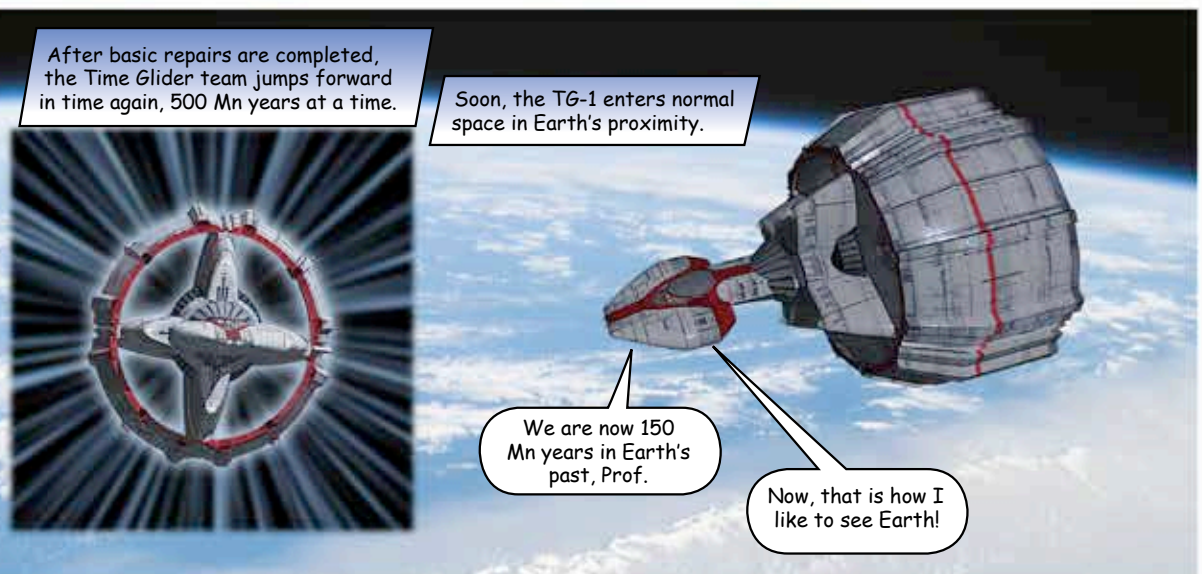
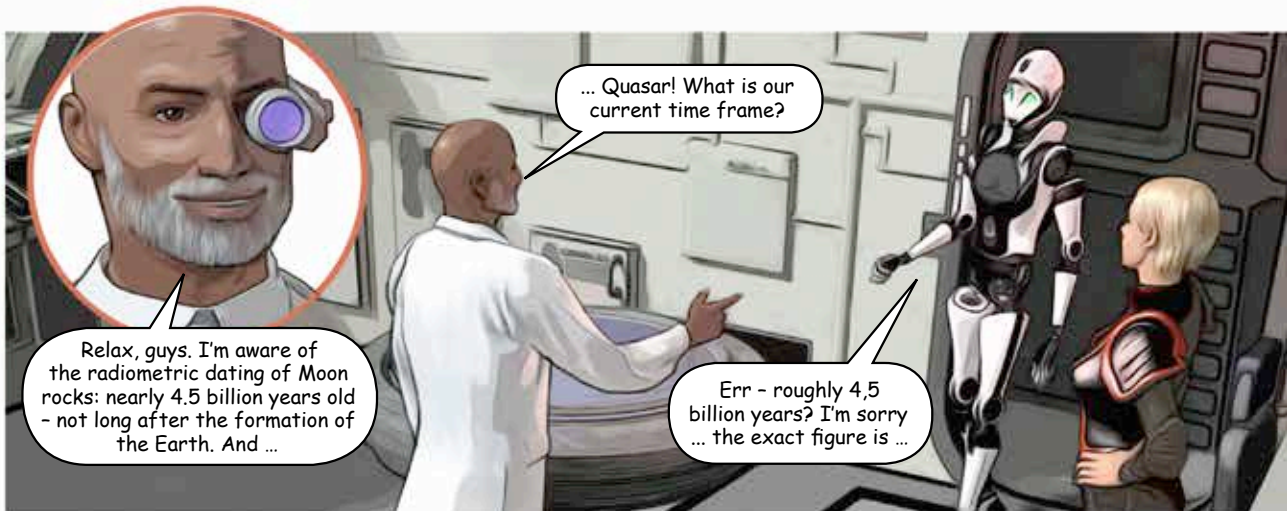
I fail to see a new moon in so much devastation.

Not yet, Deon. But in due course, that ejecta will condense into a single body. Under the influence of its own gravity, it will form a more spherical body - the Moon!

But how could you be so sure it was that object that is going to help form the Moon? What if it were some other object about to destroy Earth?

A calculated guess.

What?!





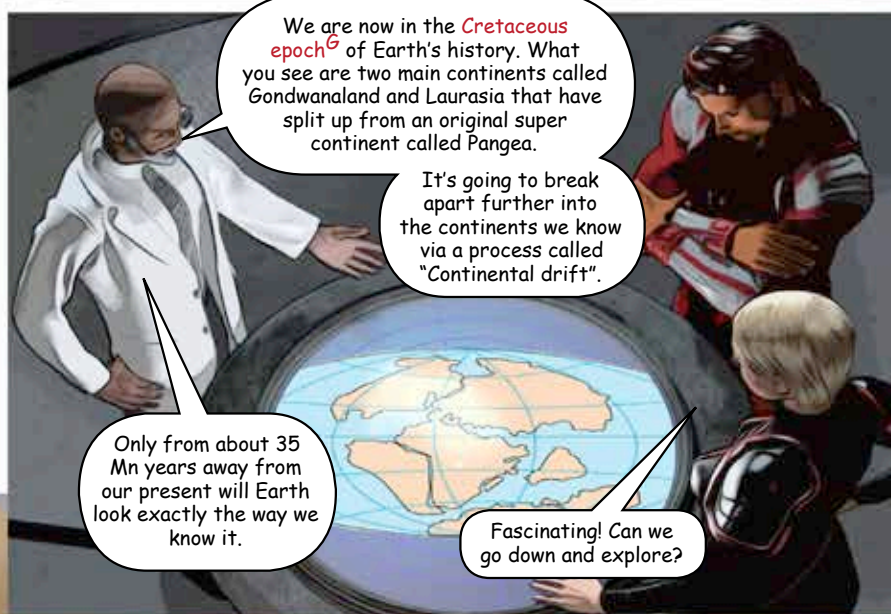


Oh yes! I feel much more at home now. Wait a minute! I don't think this is Earth - where's Africa?



And where is America, or Australia?

Ahem! Yes, it's not quite our modern Earth - yet. Come, let me explain.



We are now in the **Cretaceous epoch** of Earth's history. What you see are two main continents called Gondwanaland and Laurasia that have split up from an original super continent called Pangea.

It's going to break apart further into the continents we know via a process called "Continental drift".

Only from about 35 Mn years away from our present will Earth look exactly the way we know it.

Fascinating! Can we go down and explore?



Hmmm...I guess a little detour won't hurt. Let's go check it out!



We have entered Earth's troposphere, Prof!

Suddenly there is a hard bump from the outside ...

THUMP



What the heck was that?



Suddenly the craft shudders and gets yanked to one side.



As the TG-1 breaks through the clouds ...

Report!

We have damage to atmospheric engine three!

There are the culprits! One must have hit the air intake!

Flying dragons!!

No Liz, those look like Quetzalcoatlus - the biggest flying reptile ever discovered!

We have bigger things to worry about right now - we are losing altitude!

This is getting boring. Can nothing go right on this darn mission?

I will have to make an emergency landing. Brace for possible impact! Quasar - activate emergency bio containment fields!

Next: "Prehistoric times"





## Win gifts throughout the year while you learn with fun!

Every month, the best team wins goodie-bags with posters, comics, CDs, cool BW friendship bands and more.

At the end of each year, the top 5 teams win the BW Fun-do Band 'Hall-of-Fame' certificates, mementos and t-shirts! The top most team will also win a rolling shield.

[www.bwmag.in/fun-do-band](http://www.bwmag.in/fun-do-band)

## 5 easy steps!

### Step 1

Form a team with four other friends who are not subscribers of Brainwave.

### Step 2

Give your team a name (e.g. The Smartensteins) and choose a captain.

### Step 3

Email the full names of your team members and captain to [brainwave@ack-media.com](mailto:brainwave@ack-media.com)

### Step 4

Click on the website link that we email to each of you and register.

### Step 5

As a team, perform DIY, Toy Box, Eye See and Magic Science every month. Submit your observations and start winning!

**Go, gather your friends now and have five times the fun!**



We all have teachers who inspire us to love science and to ask questions with an open mind. They could be at school or they could be friends and family members. Nominate them for the BW science super-teacher awards and let the world know about them!

If your nominee wins, you get a cool gift too!

Email their name and school along with 100 words on why you are nominating them to [brainwave@ack-media.com](mailto:brainwave@ack-media.com)

[www.bwmag.in/bw-super-science-teacher-awards](http://www.bwmag.in/bw-super-science-teacher-awards)

# Treasure Hunt!

The Treasure Hunt is here. This time too, it is very simple! There is just one question that you need to answer to unearth the treasure:

*Minerals are naturally occurring substances. There are about 3,000 different types of minerals. Minerals are identified according to various properties. Research and tell us how minerals are different from rocks, and how minerals are identified.*

oooooooo

What are you still waiting for? Get started - top two entries will win two cool books each from Leadstart Publishing. Email your answers to [brainwave@ack-media.com](mailto:brainwave@ack-media.com) with 'Treasure Hunt' as the subject.

Keep in mind - any entry that is directly copied from the internet will be disqualified!

LEADSTART  
Publishing

**2 WINNERS  
GET 2 COOL  
BOOKS,  
EXCLUSIVE  
FROM  
LEADSTART  
PUBLISHING!**



The BW Student Board members work with our editorial team and make a difference to the magazine.

In addition to this, their work is published in the magazine and they get to lay their hands on all BW products before anyone else - for free!

At the end of their tenure, we award them with certificates and an honourarium of Rs. 1250 each.

For more information, visit:  
[www.bwmag.in/student-board](http://www.bwmag.in/student-board)

## BW STUDENT BOARD







**p09**

**Galvanometer:** A galvanometer is an instrument for detecting electric current. These were the first instruments used to detect and measure electric currents.

The deflection of a magnetic compass needle by current in a wire was first described by Hans Oersted in 1820. Johann Schweigger and André-Marie Ampère also contributed to its development.

**p24**

**Oil Spill:** An oil spill is the release of liquid petroleum product into the environment, especially marine areas. This may be due to releases of crude oil from tankers, offshore platforms, drilling rigs and wells, refined petroleum products and their by-products, or heavier fuels used by large ships.

Some studies suggest that less than 1% of oil-soaked birds survive. Spilt oil reduces their insulating ability, makes them less buoyant in water, prevents mothers from finding their babies due to the strong scent of oil, impairs birds' ability to fly, prevents them from foraging or escaping from predators, irritates their digestive tract, altering liver and kidney functions, and harms them in many other ways.

**p31**

**Space-based Solar Power:** SBSP is the concept of collecting solar power in space for use on Earth. The collected energy would reside on an orbiting satellite instead of on Earth's surface.

Benefits of this are - higher collection rates and longer collection periods due to the lack of a diffusing atmosphere and night-time in space.

**p36**

**MRI:** Magnetic resonance imaging is a medical imaging technique to visualize internal structures of the body in detail. MRI can create more detailed images than X-rays.

**Particle Accelerator:** A particle accelerator uses electromagnetic fields to propel charged particles to high speeds and collide them, to understand the behaviour of the Universe in early stages of its formation.

**p43**

**Cretaceous Epoch:** In geologic time, this is a period that began 145.5 million years ago and ended 65.5 million years ago. It followed the Jurassic Period and spanned 80 million years. Oceans and seas were populated with marine reptiles and dinosaurs dominated on land. The period ended with a large mass extinction.

## Spot The Errors

Finished reading the magazine?

We have an innovative contest instead of a quiz this time. Win it and a **mystery gift worth Rs. 500** is yours!

### What you need to do:

There are a few mistakes in this magazine. They are either science or English grammar related. Identify as many of these as you can and email them to us at [brainwave@ackmedia.com](mailto:brainwave@ackmedia.com)

Please ensure that you mention the page and paragraph numbers of each mistake.

o o o o o o o o o

To take part in some cool science initiatives, visit [www.bwmag.in](http://www.bwmag.in)

Parents and teachers, here's something unique for you:

[www.bwmag.in/category/parent-teacher-guide](http://www.bwmag.in/category/parent-teacher-guide)

Readers, get to see behind the scenes:

[www.facebook.com/brainwavemag](https://www.facebook.com/brainwavemag)

# SUBSCRIBE NOW!

Pay only ₹ ~~720~~ 580!  
Get 12 issues of

20%  
OFF



Why pay ₹ 60 every month (that's ₹720 a year)  
at your news-stand to enjoy Brainwave?

Now, Brainwave is the perfect balance of science and fun, which will make you call your friends up and say, "Guys, let's play science!"

You get 48+ pages of comics, stories, experiments and contests. There is a Treasure Hunt too! You can win many exciting prizes and even be on our **Student Board**.

## SUBSCRIPTION TYPE

- ☐ 1 year: Brainwave - ₹580
- ☐ 2 year: Brainwave+Mystery Gift of ₹299 - ₹1150
- ☐ 1 year: Brainwave+Tinkle magazine - ₹880

Publisher, at its sole discretion, shall have the right to revise the offer or subscription price.

## YOUR DETAILS\*

Student's Name: \_\_\_\_\_  
Guardian's Name: \_\_\_\_\_  
Date of Birth: \_\_\_\_\_ (DD MM YYYY)  
Address: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
City: \_\_\_\_\_  
State: \_\_\_\_\_  
School: \_\_\_\_\_  
Class: \_\_\_\_\_  
Email (Student): \_\_\_\_\_  
Email (Guardian): \_\_\_\_\_  
Tel of Guardian: (R): \_\_\_\_\_  
Mobile: \_\_\_\_\_

\_\_\_\_\_  
Guardian's signature

## PAYMENT OPTIONS

### ☐ CREDIT CARD

Card Type: ☐ Visa ☐ MasterCard

Please Charge ₹\_\_\_\_\_ to my Credit card

Number below:

□ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □

Expiry Date: □ □ / □ □ / □ □ □ □

\_\_\_\_\_  
Card member's signature

### ☐ CHEQUE/DD

Enclosed please find cheque/DD no. □ □ □ □ □ □

drawn in favour of 'ACK Media Direct Pvt. Ltd.'

on (bank) \_\_\_\_\_,

for the amount \_\_\_\_\_,

dated □ □ / □ □ / □ □ □ □.

### ☐ CASH: ₹ \_\_\_\_\_

Submit this form along with your payment to the assigned school staff member.

## ONLINE SUBSCRIPTION

Visit: [www.amarchitrakatha.com](http://www.amarchitrakatha.com)

Email: [brainwave@ack-media.com](mailto:brainwave@ack-media.com)

**ACK Media Direct Pvt. Ltd.**, Krishna House, 3rd Floor,  
Raghuvanshi Mills Compound, Senapati Bapat Marg,  
Lower Parel (West) Mumbai - 400013.

\* All fields are mandatory for the subscription to be activated.



# Magnetic Directions

by Pushkar Samant



Artwork: Parvati Pillai

Imagine that you are stranded in the middle of an ocean in a boat. All you can see is water all around. It is overcast and you cannot see the stars in the night sky. How would you know which way to row and save yourself?

Long before GPS satellites and other high-tech navigational aids were invented, a handy gadget, the magnetic compass, provided a simple and easy solution for such problems.

Like all magnetic fields, the Earth's magnetic field has two main poles - north and south. A compass is a lightweight magnet, generally a magnetized needle, on a free rotating

pivot. The ability to rotate freely enables the magnetized needle to react to nearby magnetic fields. Since opposites attract, the southern pole of the needle is attracted to the Earth's natural magnetic north pole. This is how navigators are able to know which direction to take.

Early explorers used local landmarks and stars to navigate. The magnetic compass was one of the key breakthroughs in the age of exploration, and helped in discovering new lands.

And you know what? It is very easy to make this amazing device at home – just turn to the *Toy Box* page in this issue! ■





# BACKFIRED MISSIONS FILES

SCRIPT BY PRACHI SHAH | ARTWORK BY KASHMIRA SARODE

In the dark lair of Solar System's arch nemesis Dearth, another plan is being formed to destroy the newly formed Earth. His goofball assistant Heat is with him, thinking hard too.

1



Heat! We must think of a new way to destroy Earth! All our plans have backfired and have done more good than harm.

Like how we pushed Earth closer to the Sun to burn it, but made Earth suitable for life? Or the way we wrapped it in ozone with the intention of suffocating Earth and instead, helped life grow?

But, Dearth was in no mood for flashbacks.

2

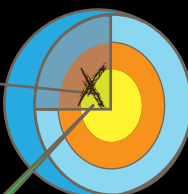


THE BOARD OF DESTRUCTION

Enough! This time, I will come up with an unfailable plan! Get me my evil drawing board!

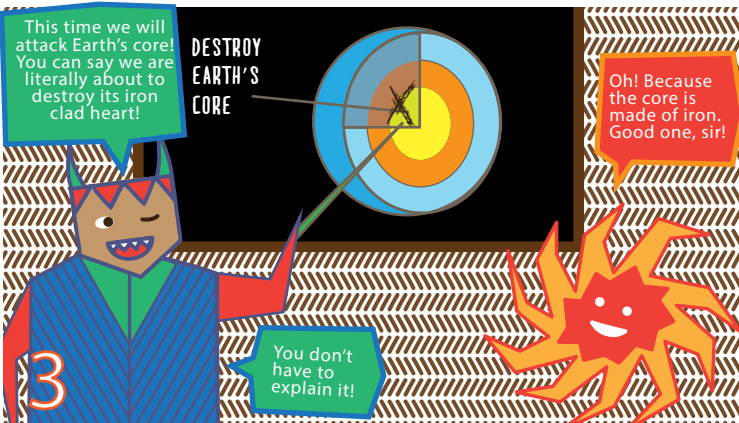
This time we will attack Earth's core! You can say we are literally about to destroy its iron clad heart!

DESTROY EARTH'S CORE



Oh! Because the core is made of iron. Good one, sir!

3



You don't have to explain it!

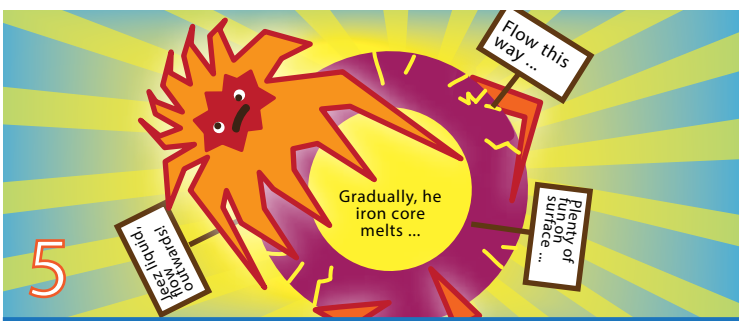
So what was this plan? Dearth was going to use Heat's immense power to melt the entire solid iron core of Earth. The molten metal would add to the lava, slowly overflow and destroy the planet.



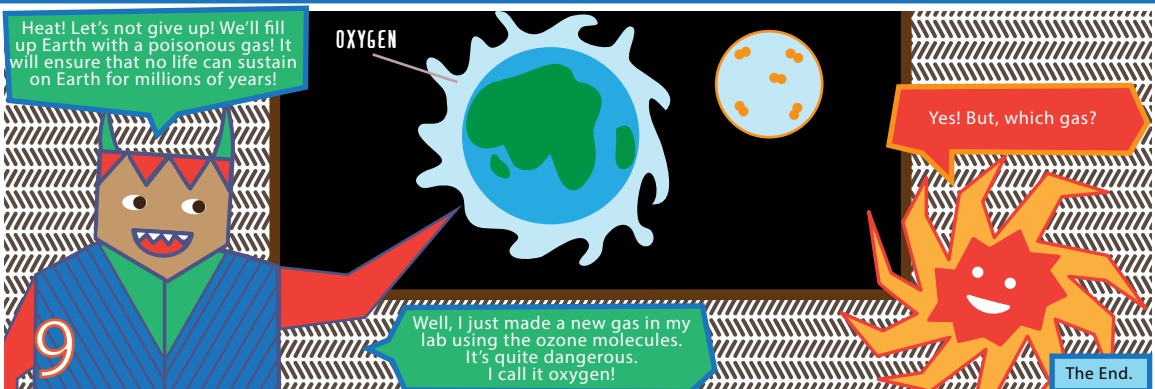
4

Heat stealthily moves into Earth's core and starts melting it with all his power.

5



But, the melted iron won't budge from its place! After several days, heat begins to get tired.



\* Refer to infographic on page 17.





**BORN TO BE  
ME**

*Follow the voice inside,  
the voice that makes you one of a kind.*

**CELEBRATING YOUR UNIQUENESS.**



Scan with your smartphone &  
join us on facebook/classmate

Email us at [classmate@itc.in](mailto:classmate@itc.in) or call 1800 425 3242

**classmate**  
BECAUSE YOU ARE ONE OF A KIND

**PARLE**

# Melody Cool Tattoo Offer!

A stylish range of crazy-cool tattoos is here! Get one tattoo free with two Parle Melody toffees. Wear them, like you wear your attitude and bling it on.

Collect them all - the more you get, the better your style!

**Melody Khao AUR KHUD KA STYLE DIKHAAD**

**FREE TATTOO**

Offer valid till stocks last. Stocks also available without this offer.

everest/PB/276-13

## WHAT IS BRAINWAVE?

Brainwave is a children's science magazine from the house of Amar Chitra Katha and Tinkle.

We understand that each child has a different aptitude and love for science. Hence, we simplify science into forms that excite them - comics, stories, fun-do activities, contests and fascinating facts.

**Give your child a Brainwave, and science will be just another game!**